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GEOLOGICAL SURVEY OF CANADA.

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CATALOGUES

OF

THE SILURIAN FOSSILS

OF THE ISLAND OF ANTICOSTI,

WITH DESCRIPTIONS OF SOME NEW GENERA AND SPECIES.

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By E. BILLINGS, F.G.S.,

Palæontologist, G. S. C.

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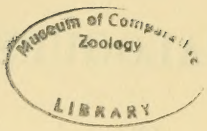

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NOTE.

It should have been stated on page 81 that the Lévis formation is now divided, the upper portion having been set apart under the designation of the Lauzon formation.

The three species of fossils referred to the Sillery occur in the upper part of the Lauzon, near the base of the Sillery.

In the fifth line from the top of page 81, for 3 read 5.

GEOLOGICAL SURVEY OF CANADA.

Catalogue of the Lower Silurian Fossils of Anticosti, with Descriptions of some of the Species.

The Lower Silurian rocks of Anticosti occupy the west end and all of the north side of the island except that portion which lies between Fox Point and the eastern extremity, — a distance of fourteen miles. They consist of pure and argillaceous limestones interstratified with a sparing amount of shales, lying in nearly horizontal strata or with a gentle dip towards the south. Their thickness is estimated at about 950 feet, and their fossils show them to be of the age of the Hudson River formation, or very nearly so.

The south side, the east end, and the fourteen miles of the north coast above mentioned as lying between Fox Point and the eastern extremity, are occupied by rocks of the age of the Middle Silurian. A separate catalogue of the fossils of this portion will be given next after the present one.

In the Hudson River formation the following species have been collected.

PROTOZOA.

No remains of Protozoa have been detected in the Lower Silurian, but in the next formation above several species have been collected which may perhaps belong to this division.

ZOOPHYTA.

Genus Heliolites, Dana.

H. affinis, B., Can. Nat. Geol. [2], vol. ii, p. 427. — Corallum hemispheric, globular, pyriform, clavato turbinate or tuberose, sometimes incrusting other fossils in a thin layer; cells usually circular, often sub-polygonal, in contact with each other or barely separate, from half a-line to little less

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Note.—*Abbreviations.*—H. R. = Hudson River formation. A. G. = Anticosti group. B. = Billings. The names appended to the descriptions, such as T. C. Weston, J. Richardson, &c., are those of the discoverers of the species.

than one line in diameter, the more common width being about two-thirds of a line, their margins thin, distinctly elevated above the general surface, and, in perfect specimens, crenulated or serrated with twelve small, rough, pointed tubercles. Septa rudimentary, rarely visible; but in certain conditions of preservation distinctly striating the inside of the cells and tubes below. The tabulæ are usually horizontal, three or four in one line. Owing to the close arrangement of the tubes there is very little cœnenchyma, and this is vesicular.

When the cells are closely crowded together they become more or less prismatic with polygonal apertures, and it is then difficult to distinguish the specimens from certain species of *Favosites*. In general, however, they are circular although in contact or nearly so. Colonies are occasionally found with the cells distant about half their diameter.

The species to which this is most nearly related is *H. tubulata* (Lonsdale), common in the Wenlock limestone. That species, however, as described by McCoy, Edwards and Haime and others, has the cells in general somewhat smaller and the apertures not so strongly serrated.

The crenulations on the margins of the cells are only visible when the surface is not at all abraded. The least wearing removes them, and the apertures are then simply circular or sub-polygonal.

This species has been found at Wreck Point; H. R. Also at White Cliff, Junction Cliff, Wall's Cove, South Point and other localities, in Divisions 1, 2 and 3, A. G. J. Richardson and T. C. Weston.

Genus FAVOSITES, Lamarck.

F. PROLIFICUS, B., op. cit., p. 429.—Corallum forming large hemispheric or irregularly convex masses. Tubes about one line in diameter. Tabulæ thin and either complete or imperfect, sometimes filling the tube with vesicular tissue. They are often very numerous, there being sometimes six or seven in one line. No septa or mural pores have yet been detected, and it may be that this species should be placed in another genus. Hudson River formation and throughout the Middle Silurian. J. Richardson and T. C. Weston.—(*F. prolificus*, Billings,—loc. cit. *F. Gothlandica*, pars, Geol. Can. p. 221, 222, 299, 301, 302, 303, 304, 306, 307.)

F. CAPAX, n. sp. — Corallum forming large depressed hemispheric or irregular masses. Tubes, when full grown, about two lines in diameter; a few of smaller size scattered among the larger. Tabulæ thin, flat, horizontal, sometimes convex or concave and oblique; about one line distant. Inner faces of the tubes obscurely striated longitudinally and wrinkled transversely. Pores small, situated in the angles of the tubes but none were observed on the faces. This species, in the position of the pores, resembles *F. alveolaris*, Goldfuss, and also, *F. aspera*, D'Orbigny (Ed-

wards and Haime, Coralliares, v. iii, p. 252) but has smaller tubes. West end; H. R. J. Richardson.

The above description is founded on a single specimen, a portion of a large mass, and further observations may render some modification necessary.

Genus STENOPORA, Lonsdale.

Among the fossils from Anticosti there is a great variety of forms belonging to this genus. In many instances it is impossible to decide whether a particular form is new, or should be referred to some one of the numerous described species. I shall dispose of the most common as follows provisionally.

S. FIBROSA, Goldfuss. — Occurs throughout the Lower and Middle Silurian rocks of Anticosti.

S. MAMMULATA, D'Orbigny. — Wreck Point; H. R.

S. PAPILLATA, McCoy.—Incrusting an *Orthoceras*, at English Head; H. R.

S. EXPLANATA, McCoy. — Occurs at the west end; H. R.

Genus HALYSITES, Fischer.

H. CATENULATUS, Linnaeus.—Occurs at the west end of the island; H. R. And also at numerous localities throughout the Anticosti group.

Genus PETRAIA, Munster.

P. ANGULATA, B., Pal. Foss., vol. 1, p. 103.—Occurs at Charleton Point and at the west end of the island; H. R.

P. SELECTA, B., Can. Nat. Geol. [2], vol. ii, p. 429.—Base acutely pointed; above, rather slender for the first few lines, then more rapidly enlarging. Depth of the cup about two-thirds of its width at the margin, septal striæ four or five in two lines. The plane of the margin of the cup is, in all the specimens I have seen, very oblique, always inclining towards the concave side. Length of largest specimen seen fifteen lines; width of cup twelve lines. In general, the individuals are more slender. West end Lighthouse; H. R. Also at Gamache Bay; Div. 1, A. G.

Genus ZAPHRENTIS, Rafinesque.

Z. AFFINIS, B. op. cit., p. 430.—Three or four inches in length, expanding to a diameter of eighteen lines at the height of three and half inches, moderately curved, sometimes with strong irregular annulations. In a polished longitudinal section the tabulæ are seen to be thin, flexuous, closely crowded together and extending all across or nearly so. There are about two septal striæ on the surface in one line, and thus, where the diameter

is eighteen lines, there must be, at the margin, about one hundred septa. In part of a weathered cup some of the septa run along the upper surface of the tabulæ nearly to the centre. This species is allied to *Z. Canadensis*, but differs in having the principal septa more developed, and in its more irregular growth. The cup has not been seen. It is possible that this and *Z. Canadensis* may belong to a different genus, perhaps to *Omphyma*. Wreck Point and White Cliff; H. R. Also at Gamache Bay; Div. 1, A. G.

Z. BELLISTRIATA, B., op. cit., p. 430.—Turbinate, gradually enlarging from an acutely pointed base, moderately and sometimes irregularly curved. There are about sixty septa where the diameter is one inch. Many of these, in the lower part, reach the centre, but above the height of two inches (as shown by a polished section of a specimen), the central area is filled with irregular tabulæ. The cup, in a specimen four inches in length, is eighteen lines in depth, conical, or much narrowed towards the bottom. Surface, with five strong, rounded septal ridges in the width of three lines. On approaching the base these are more closely crowded together than they are in the higher and main body of the coral. They are crossed by fine engirdling striæ just visible to the naked eye. Length of the largest specimen observed four inches. Numerous small straight individuals from one inch and upwards occur with the larger. Wreck Point; H. R. Also, in numerous localities in Div. 1 and 2, A. G.

Genus BEATRICEA, Billings.

B. NODULOSA, B., Rep. 1857, p. 344.—Wreck Point, Salmon River, Battery Cliff, and other places in the upper part of the H. R. It also ocurs in Div. 1, A. G.

B. UNDULATA, B., op. cit., p. 344.—Macasty Bay and near the west-end light-house; H. R. Also at Cape James, Table Head, Gamache Bay, and numerous other localities in Div. 1 and 2, A. G.

It has been found in the upper part of the H. R. at Lake St. John on the Saguenay River; and in the same horizon on several of the Islands in Lake Huron.

ECHINODERMATA.

Genus PLEUROCYSTITES, Billings.

P. ANTICOSTIENSIS, B., Dec. iii, p. 52.—Charleton Point; H. R.

Genus RETEOCRINUS, Billings.

R. FIMBRIATUS, B., Dec. iv, p. 65.—Charleton Point; H. R.

Genus CARABOCRINUS, Billings.

C. TUBERCULATUS, B., op. cit., p. 33.—Charleton Point; H. R.

Genus DENDROCRINUS, Hall.

D. LATIBRACHIATUS, B., op. cit., p. 39.—Charleton Point; H. R.

D. TENER, n. sp.—Cup small, sub-pentagonal; arms very long, several times branched; column slender pentagonal. Length of cup about 3 lines; width of the same at the margin about 2½ lines; length of the arms 19 lines; diameter of the column about half a line. The specimens are all imbedded in the rock, and full details cannot, at present, be given. It occurs in several localities at the west end of the island; H. R. J. Richardson.

Genus PALASTERINA, McCoy.

P. RUGOSA, B., Dec. iii, p. 77.—Charleton Point; H. R.

POLYZOA.

Genus PTILODICTYA, Lonsdale.

P. FRAGILIS, n. sp.—Polyzoary consisting of narrow ligulate, two edged branching fronds with the cellular surfaces gently and uniformly convex. Cells ovate, their length rather more than one-half greater than their width, surrounded with an obscurely elevated margin, seven or eight in the length of one line and ten or twelve in the same space in width. On each side there are two or three rows of oblique cells. Those which occupy the middle of the frond are arranged in straight longitudinal rows. There is a distinctly elevated line between each two rows The proportional length and width of the cells appears to be somewhat variable. The fronds, examined are from two-thirds to one line in width. Occurs at Charleton Point; H. R. Also at Junction Cliff; Div. 1, A. G. J. Richardson.

P. NITIDULA, n. sp.—Polyzoary consisting of narrow, thin, ligulate branching fronds, which are sharp-edged and very slightly convex on the sides. Cells small, ovate, from seven to eight in the length of one line and from ten to twelve in the same space in width, arranged in straight longitudinal rows, width of specimens about one line. This species differs from *P. fragilis* in not having the oblique cells at the edges of the fronds. Charleton Point and Salmon River; H. R. J. Richardson.

P. CANADENSIS, n. sp.—Polyzoary a single elongated frond, gradually expanding in width from an acute point to six lines in a length of three and a-half inches. Cells oblong ovate, six or seven in the length of one

line and about twelve in the same space in width; arranged in both longitudinal and transverse rows, the latter sloping a little upwards from near the middle outwards to each of the edges. Charleton Point; H. R. J. Richardson.

I have seen only one specimen of this species and from it the above description was drawn up. It resembles *P. lanceolata* in general form but seems to have smaller cells.

P. GLADIOLA, n. sp.—Polyzoary, consisting of a single elongated, narrow, two-edged, unbranched frond, usually curved, gradually expanding from an acute point to a width of about one line in a length of from one to twenty-eight lines, moderately convex, often sub-angular along the middle and with flat slopes to the edges, which are acute. Cells oblong; when perfect, nearly rectangular at their extremities; when worn, one or both ends rounded; their length about twice their width, six to eight in the length of one line, arranged in very regular longitudinal rows, of which there are about twelve where the width of the frond is one line. The largest frond seen is 28 lines in length and 1¼ in width at the larger extremity.

Near the west end Light-house; H. R. Also at numerous localities on the south side and east end of the island, in Divs. 1, 2, 3, A. G. J. Richardson.

BRACHIOPODA.*

Genus LINGULA, Brugiere.

L. QUADRATA, Eichwald.—Occurs at Charleton Point and English Head; H. R. Also at Junction Cliff in Div. 1, A. G. Mr. Shaler has described this species under the name of *L. elegantula*, and in this he may be right, but at present I think it not sufficiently different from the Russian species to deserve a new name. At all events it is the same form (occurring in the Trenton limestone) which we have always considered to be *L. quadrata*.

L. CANADENSIS, B., Pal. Foss., vol. i, p. 114.—Black Point; H. R.

L. FORBESI, B., op. cit., p. 115. English Head; H. R. Also at Junction Cliff; Div. 1. A. G,

Genus EICHWALDIA, Billings.

E. ANTICOSTIENSIS, n. sp.—Shell larger than *E. subtrigonalis*, but proportionally not so convex. Ventral valve ovate; greatest width a little

* Mr. N. S. Shaler has described a number of the species of Brachiopoda from Anticosti, in Bulletin No. 4, of the Museum of Comparative Zoology, Cambridge. As many of the names adopted by him are different from those in this work, I shall give a list of his species at the end of the catalogue of the fossils of the Anticosti group.

in front of the mid-length; umbo narrowly rounded; apical angle about 90; front margin broadly rounded or gently convex; sides, in the upper half, somewhat straight and uniformly converging from a little below the mid-length to the beak; in the lower half uniformly rounded into the front margin. The beak is not visible in any of the specimens examined, but is incurved, at the least, nearly down to the plane of the margin. This valve is moderately and evenly convex, the outline on a side view most strongly curved in the upper half. The cast of the interior shows a straight groove commencing at the beak and extending along the middle about half way to the front. This is caused by the mesial septum. The dorsal valve has not been recognized. Length of the best preserved specimen 16 lines; greatest width 18 lines. Near the west end Light-house; H. R. J. Richardson.

Genus Trematis, Sharpe.

T. Ottawaensis, B., Pal. Foss. vol. i, p. 53.—Macasty Bay; H. R. One specimen 12 lines wide, shows the foramen: it is a small notch on the hinge scarcely a line in depth. This proves that this species is quite distinct from *T. Huronensis* in which the foramen extends nearly to the centre of the valve.

Sharpe in describing *T. cancellata*, Sowerby, brought by Dr. Bigsby from Lake Simcoe, says "the fissure in the ventral valve is small and close to the hinge." It may be therefore, and indeed it seems probable, that our species is identical with *T. cancellata*. Mr. Davidson has expressed the same opinion in a letter lately received from him. It would however be imprudent to unite the two under one name without comparing specimens with the original.

Genus Strophomena, Rafinesque.

S. nitens, B. Can. Nat. Geol., vol. 5, p. 54.—Charleton Point, Macasty Bay, English Head, and many other localities; H. R.

S. Ceres, B. op. cit. p. 54.—Charleton Point; H. R. A species which is either identical or closely allied also occurs in the Anticosti group, and is widely distributed.

S. fluctuosa, B. op. cit. p. 54.—Charleton Point and at various other localities; H. R. Also in the Trenton limestone at the City of Ottawa.

S. Hecuba, B. op. cit. p. 60.—Numerous localities; H. R.

S. imbrex, Pander.—Cape Robert; H. R.

S. subtenta, Conrad.—English Head; H. R.

S. Arethusa, B. Pal. Foss., vol. 1, p. 132.—Observation Cape; H. R.

S. PLANUMBONA, Hall.—Charleton Point and at the west end of the island; H. R. Also at Junction Cliff; Div. 1, A. G.

S. ALTERNATA, Conrad.—A variety of this species occurs at several localities; H. R. Also throughout the A. G.

Genus LEPTAENA, Dalman.

L. SERICEA, Sowerby.—Abundant in the H. R. and also in Div. 1, A. G.

Genus ORTHIS, Dalman.

O. TESTUDINARIA, Dalman.—A variety occurs at Marsdle Cliff; H. R.

O. SUBQUADRATA, Hall.—Abundant at Charleton Point, and more rarely at English Head and the west end of the island; H. R.

O. LYNX, Eichwald.—Charleton Point; H. R., rarely; abundant at Junction Cliff; Div. 1, A. G.

O. MARIA, B., Pal. Foss., vol. i, p. 137. Macasty Bay; H. R. Also more abundantly at Gamache Bay; Div. 1, A. G.

O. SOLA, n. sp.—Shell small, nearly circular; width a little greater than the length; sides and front uniformly rounded; hinge line a little more than half the whole width; both valves convex and without either fold or sinus. Ventral valve rather strongly convex, most tumid at about one-fourth the length from the beak; scarcely at all compressed at the cardinal angles; area forming an angle of about 100° with the place of the margin in the basal third of its height, and, in the other two-thirds, incurved so as to become parallel with that plane near the beak; the latter minute and pointed; foramen scarcely as wide as it is high; dorsal valve uniformly convex; greatest elevation a little above the centre; cardinal angles slightly compressed; area two-thirds the height of that of the ventral valve, inclined at an angle of about 110° with the plane of the lateral margin; slightly concave; beak small, pointed, incurved; foramen filled with the divaricator process. Surface with fine acutely angular ribs, dividing several times between the beak and the margin, about five in the width of one line. Length 4½ lines; width about five lines; length of the hinge line 3 lines; distance between the dorsal and ventral beaks ⅔ of a line; depth of both valves 2½ lines. Salmon River; H. R. J. Richardson.

Genus RHYNCHONELLA, Fischer.

R. CAPAX, Conrad.—Abundant at Charleton Point; more rare at English Head, Macasty Bay, and other localities; H. R.

R. ANTICOSTIENSIS, B., op. cit., p. 142.—Charleton Point and English Head; H. R.

R ? RECURVIROSTRA, Hall.—This species or one closely allied to it occurs abundantly in numerous localities; H. R.

Genus ATHYRIS, McCoy.

A ? ANTICOSTIENSIS, B., op. cit., p. 147.—Abundant near English Head; H. R.

LAMELLIBRANCHIATA.

Genus CYRTODONTA, Billings.

The internal characters of the following species, have not been ascertained, and they are, therefore, classified provisionally as below. I doubt that any of them belong to the genus.

C ? HARRIETTA, B., op. cit., p. 149.—English Head; H. R.

C ? EMMA, B., op. cit., p. 150.—English Head; H. R.

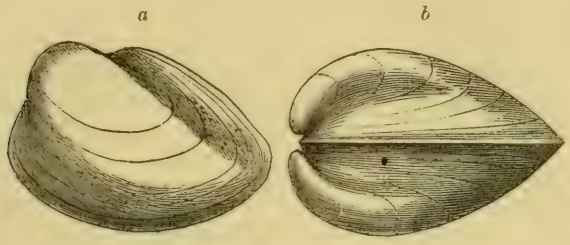

Fig. 1.

Fig 1.—*Cyrtodonta? sigmoidea. a*, left valve; b, dorsal view.

C ? SIGMOIDEA, B. Can. Nat. Geol. vol. iii, p. 438.—Obliquely subrhomboidal, strongly ventricose. Anterior extremity short, rounded, scarcely projecting in front of the beaks; ventral margin broadly convex, the whole length; posterior portion of the shell tapering to a rounded angle situated at about half the height; hinge line scarcely half the whole length, sloping upwards and backwards; a little more than the posterior half of the dorsal margin nearly straight and sloping down to the posterior angle. The beaks are small, closely incurved and usually in contact or nearly so. A strong rounded convexity commences at the beaks and passing along the upper side of the umbones, runs with a sigmoid curve backwards and downwards. Length usually 18 lines; height twelve lines; depth of both valves 12 lines. Specimens two inches in length occur. This species has nearly the same form as *C. Hindi*, but is shorter in propor-

tion to the height. Macasty Bay, and near the West-end Light-house; H. R. J. Richardson.

Fig. 2.

Fig 2.—*Cyrtodonta? plebeia.*—Three views of a specimen destitute of the shell.

C ? PLEBEIA, n. sp.—Obliquely ovate or obscurely rhomboidal, strongly ventricose. In the cast of the interior the beaks project beyond the anterior extremity, which is rounded and not strongly developed. The ventral margin is moderately convex the whole length; dorsal margin sloping from a little in front of the mid-length to the pointed posterior extremity. Beaks small, incurved, but not in contact. On a dorsal view the outline is cordiform, the umbones angular on the upper side. Length 12 lines; height about 6 lines; depth of both valves 8 lines. Charleton Point; H. R. J. Richardson.

C ? ANTICOSTIENSIS, n. sp.—Shell rather strongly convex; anterior extremity short rounded; ventral margin straight or slightly convex for a short space partly in front of the mid-length; posterior extremity broadly and nearly uniformly rounded, the most projecting point a little below the middle; dorsal margin elevated in the posterior half; hinge-line apparently about half the length. The beaks are closely incurved; umbo rather large and convex; greatest gibbosity of the shell at about one-third of the length from the anterior extremity and a little above the mid-height. Length of largest specimen seen 13 lines; height at 5 lines from the posterior extremity 10 lines; height at the umbones 7 lines; greatest depth of a single valve 5 lines. Surface unknown but most probably concentrically striated. English Head; H. R. J. Richardson.

C ? INSULARIS, n. sp.—Sub-ovate; beaks nearly terminal; anterior extremity obscurely developed; ventral margin gently convex; posterior extremity nearly uniformly rounded; dorsal margin somewhat straight; slightly compressed and elevated, gradually rounded into the posterior margin. Length from the beaks to the middle of the posterior extremity 14 lines; height at one third the length from the same point 11 lines; depth of both valves about 8 lines.

Of this species several specimens have been obtained, but they are all in an imperfect state. It has somewhat of the form of an *Ambonychia*,

(gradually enlarging from the beaks to the opposite extremity) but the concentric markings on the casts induce me to believe that it does not belong to that genus.

West end of the island; H. R. J. Richardson, T. C. Weston.

C? UNGULATA, n. sp.—Obliquely ovate, cordiform, extremely tumid; anterior extremity short rounded; ventral margin rather strongly and uniformely convex; posterior extremity sub-angular about the mid-height, obscurely rounded above. The beaks are long and much incurved, but not in contact. The greatest gibbosity is a little in front of the middle. From the beaks the principal convexity extends with a somewhat sigmoid curve backwards and downwards towards the lower posterior margin. Surface with a number of concentric sub-lamellose ridges of growth which leave their impressions on the cast of the interior. Length 19 lines; height 14 lines; depth of both valves 15 lines. In a dorsal or ventral view the outline is broadly cordiform, the beaks turning forward and downwards with a hook-shaped curve. The space between the beaks (in the only specimen collected) is obscured by the matrix so that the characters of the hinge line cannot be ascertained.

Macasty Bay; H. R. T. C. Weston.

Fig. 3.

Fig. 2.—*Cyrtodonta? ungulata.* *a*, right valve; *b*, anterior extremity.

Genus PTERINEA, Goldfuss.

P. BELLILINEATA, n. sp.—Left valve gently convex obliquely, semi-elliptical; hinge line long and straight; anterior side obliquely rounded; uniformly curving into the ventral margin; posterior side slightly concave, below the cardinal angle, and then rounded into the ventral margin. The beaks and anterior wing are not visible in the specimen, being buried in the matrix. Surface with very distinct and slightly undulated raised lamellose concentric lines, about two in one line. They cover the whole surface up to the umbones. Obscure indications of radiating striæ can be made out. Length on the hinge line 15 lines; height 12 lines. White Cliff; H. R. J. Richardson.

P. PROLIFICA, n. sp.—Obliquely sub-rhomboidal; anterior side nearly straight for about half the length, sometimes a little concave near the hinge line, and often gently convex, forming an angle of about 75° with the hinge line; ventral margin uniformly rounded; posterior side concave just below the angle and convex in the lower half. There is, sometimes, a small anterior wing, but in many individuals it is either very slightly or not at all developed. Posterior wing moderately compressed. Beak small, scarcely elevated above the area, the latter about one line wide in the left valve and less in the right. The left valve varies from gently to moderately convex. Right valve gently concave. The anterior and posterior sides are sub-parallel. The umbones are between one-fourth and one-third of the length of the hinge line from the anterior angle. Surface with obscure concentric striæ and rugose lamellae of growth. Length of a large individual on the hinge line, two inches; height the same. Differs from *P. demissa*, Conrad, in being in general one-fourth shorter from the hinge-line to the ventral margin.

Charleton Point and Macasty Bay; H. R. J. Richardson, T. C. Weston.

Genus ISCHYRINIA, N. G.

GENERIC CHARACTERS.—Equivalve, inequilateral, two strong ridges radiating from the beak in the interior of each valve.

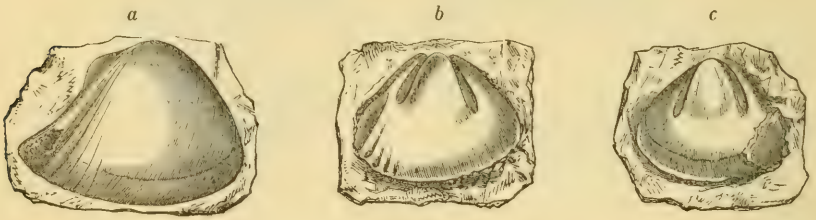

Fig. 4.

Fig. 4.—*Ischyrinia Winchelli. a*, left valve; *b*, cast of the interior of left valve; *c*, cast of the interior of right valve.

I. WINCHELLI, n. sp.—Shell triangular, strongly ventricose. Anterior? (flat side) somewhat straight, gently convex above and concave below; posterior? side slightly curved; ventral margin moderately rounded. Beaks small and obscure, closely incurved. Surface with a shallow concave groove close to the anterior edge, in which are four or five small rounded ribs all of them covered with very fine longitudinal striæ. All the remaining portion of the sides of the valves apparently smooth, but in certain lights exhibit indications of minute striæ radiating from the umbones to the ventral margin. The anterior or flat extremity is, with the exception of the small wing, gently concave. The anterior and posterior slopes form with

each other an angle of a little more than 90°. Length from posterior to anterior ventral angles 14 lines; height to the umbones 10 lines; depth of both valves about 9 lines. Macasty Bay; H. R. T. C. Weston.

Dedicated to Professor Alexander Winchell, of Ann Arbor, Michigan.

Genus AMBONYCHIA, Hall.

A. RADIATA, Hall.—A variety of this species occurs at Charleton Point and English Head; H. R. Also abundantly at Gamache Bay; Div. 1, A. G.

GASTEROPODA.

Genus SUBULITES, Conrad.

S. RICHARDSONI, B., Rep. 1857, p. 306.—Charleton Point; H. R.

S. ELONGATA, Conrad.—A variety or closely allied species occurs at Macasty Bay; H. R. Also at Junction Cliff; Div. 1, A. G.

Genus TROCHONEMA, Salter.

T. UMBILICATA, Hall.—English Head; H. R.

Genus PLEUROTOMARIA, Defrance.

P. AMERICANA, B., Can. Nat. Geol., vol. v, p. 164.—Charleton Point, and Macasty Bay; H. R.

P. HELENA, B., op. cit., p. 165.—Charleton Point and Table Head; Div. 1, H. R.

P. CIRCE, B., op. cit., p. 303.—English Head; H. R.

P. SUBCONICA, Hall.—Macasty Bay and English Head; H. R.

Genus CYCLONEMA, Hall.

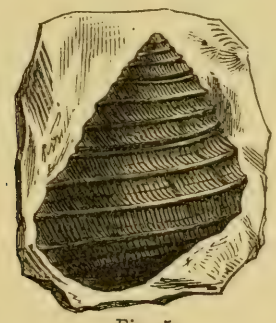

Fig. 5.

Fig. 5.—*Cyclonema Thalia.* A specimen enlarged three diameters.

C. THALIA, B., Rep., 1857, p. 303.—Charleton Point; H. R. Also at Junction Cliff; Div. 1, A. G. *Pleurotomaria Thalia*, loc. cit.

Genus MURCHISONIA, D'Archiac et D'Verneuil.

M. GRACILIS, Hall.—Charleton Point and numerous other localities; H. R. Also at Cape Sand-top Bay; Div. 2, A. G.

M. VENTRICOSA, Hall.—A species not distinguishable, in casts, from this occurs at English Head; H. R. Also at Gamache Bay; Div. 1, A. G.

M. TERETIFORMIS, B., op. cit., p. 298.—Charleton Point; H. R.

M. RUGOSA, B., op. cit., p. 299.—English Head; H. R. Also abundantly at Gamache Bay; Div. 1, A. G.

M. MULTIVOLVIS, B., op. cit., p. 299.—Macasty Bay; H. R.

M. MODESTA, B., op. cit., p. 299.—English Head and Macasty Bay; H. R.

M. VARIANS, B., op. cit., p. 300.—English Head; H. R.

Genus METOPTOMA, Phillips.

M. ALCESTE, B., op. cit., p. 153.—English Head; H. R.

M. ESTELLA, B., op. cit., p. 153.—English Head; H. R.

HETEROPODA.

Genus BELLEROPHON, Montfort.

B. ACUTUS, Sowerby.—Macasty Bay and English Head; H. R. Gamache Bay; Div. 1., A. G. This type (of a peculiar group of species of the genus) makes its first appearance so far as is yet known, in the Calciferous formation (*B. macer*, Pal. Foss. vol. i, p. 346). It occurs next in the Lévis formation (*B. Palinurus*, op. cit., p. 311). And again in the Black River limestone where we have (*B. disculus* and *B. Argo*, Geol. Can. p. 146).

B. CANADENSIS, n. sp.—Shell large with a greatly expanded aperture. Whorls two or three, but only the last one visible, strongly ventricose and sub-angular on the dorsal side, carinated ? along the median line; umbilicus at its margin about one-third the diameter of the whorl. Surface, on the dorsal side, with obscure ridges which radiate from the median line towards the margin of the aperture; they are scarcely visible on the body of the whorl, but become very prominent on the outer surface of the expansion of the aperture. In some specimens, also, they alternate in size.

On the surface of the body whorl there are indications of smaller transverse ridges giving an obscurely cancellated appearance. Width of the expansion of the aperture about 3 inches. When placed with the aperture downwards the height of the most elevated point of the whorl is 18 lines. Macasty Bay; H. R. T. C. Weston.

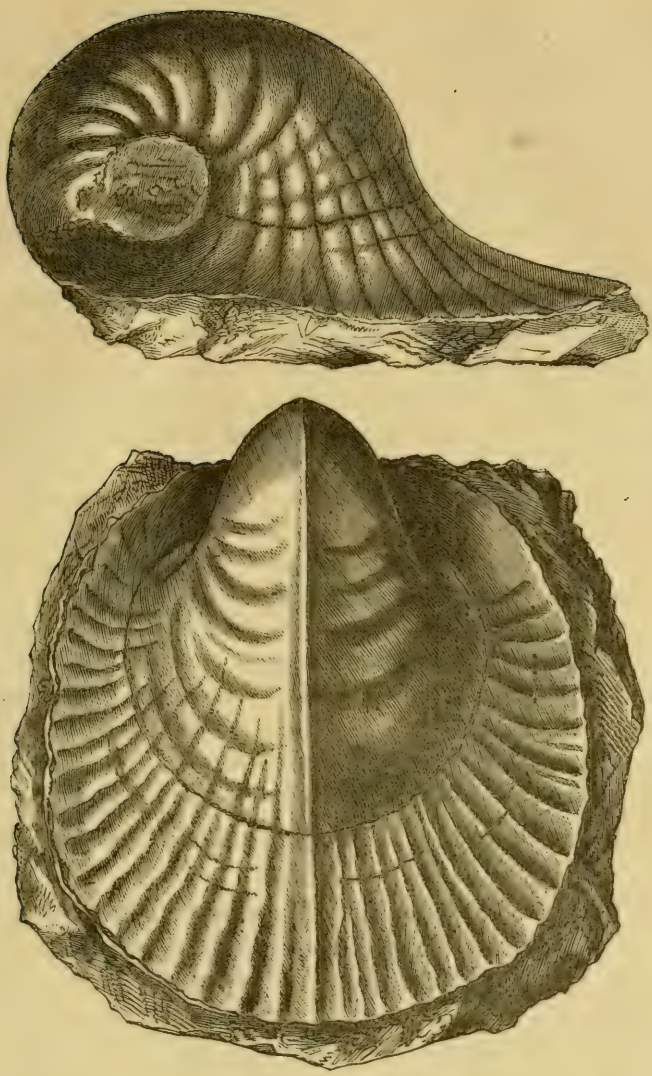

Fig. 6.

Fig. 6.—*Bellerophon Canadensis.*—Side and dorsal views.

B. FRATERNUS, n. sp.—Ovate, about one inch in diameter; whorls three or four, all visible in the deeply concave umbilicus, depressed convex on the dorsum, somewhat acutely carinated on the sides or at the umbilical edge; aperture slightly expanded, only a little larger than the body of the whorl; a sharp median ridge or keel extending from the aperture a short distance backwards. In section the tube is transversely elliptical being compressed in the dorso-ventral direction; the greater diameter

being to the less about as five is to eight. The whorls are so compactly inrolled that the ventral side of each is indented to about one fourth the thickness of the one preceding. A few obscure undulations are seen on the cast near the aperture. Surface unknown. Transverse width of the last whorl at three lines from the aperture 8 lines; dorso-ventral depth 5 lines; width of the aperture about 9 lines; diameter of the whole measured from the median point of the aperture on the dorsum through to the opposite side 13 lines; diameter at right angles to this latter measurement 11 lines.

This species is allied to *B. expansus*, Hall, from which it differs principally in having the dorsal aspect flatter, and the aperture not so greatly expanded. English Head, H. R., J. Richardson. It is possible that on the perfect shell the dorsal keel may follow the whorl the whole length, but on the cast of the interior it becomes obsolete at five or six lines from the aperture.

B. MISER, n. sp.—Shell small with the aperture widely expanded transversely. Whorls about two, but only one visible, obscurely carinated along the median line of the dorsum, thence with a flat or gently convex slope to the edge of the umbilicus, the latter small and with the edges narrowly rounded. Surface unknown. Diameter from the median point of the dorsal margin of the aperture through to the opposite side 7 lines; transverse width of the aperture 9 lines. The specimens are all imperfect. It resembles *B. Charon* (Can. Nat. Geol. v. 169; Geol. Can., 146, fig. 97) but is a much smaller species. *B. expansus*, Sowerby not Hall, is also of the same type. Macasty Bay; H. R. T. C. Weston.

B. BILOBATUS, Sowerby.—Macasty Bay; H. R. Also Gamache Bay; Div. 1, A. G.

B. SOLITARIUS.—About two inches in diameter; whorls rather strongly ventricose on the dorsum, rounded at the edge of the umbilicus; the latter scarcely one-fourth the greater diameter. The aperture is not preserved in the specimen, but it was not, judging from appearances, much expanded. The specimen measures 21 lines across from above downwards; and 15 lines in the tranverse direction. The width on the side opposite the aperture is 7 lines and where the last whorl is broken off (evidently very near the aperture,) about 11 lines. Resembles *B. fraternus*, but is more convex on the dorsum and has a smaller umbilicus. Macasty Bay; H. R. T. C. Weston.

Genus CYRTOLITES, Conrad.

C. PANNOSUS, n. sp.—Shell small, discoid. Whorls three or four, compactly inrolled, the inner ones slightly indenting the outer, all seen in the umbilicus, the dorsal aspect with a thin distinctly elevated median keel from which the surface has a gentle slope to the narrowly rounded

edge of the umbilicus. Surface with deeply serrated, zig-zag fissure-like striæ or imbrications, which cross the whorls at nearly a right angle from the dorsal keel into the umbilicus. Width of a specimen of three complete whorls 6 lines; transverse width of aperture about 3 lines. (In some it appears to be proportionally wider, but as the specimens are imbedded in stone this point cannot be accurately decided.) Height of the aperture apparently somewhat less than the width. This species is most closely allied to *C. compressus*, Conrad, but is smaller, and has the whorls in contact. English Head and Charleton Point; H. R. J. Richardson.

C. DESIDERATUS, n. sp.—This species differs from *C. pannosus* in having the whorls less slender, a specimen of three whorls being nine lines in diameter. They are also crossed by obscure transverse undulations as in *C. ornatus*, Conrad. The specimens are all casts of the interior, and the surface is therefore unknown. Macasty Bay; H. R. T. C. Weston.

PTEROPODA.

Genus CONULARIA, Miller.

C. SPLENDIDA, n. sp.—Acutely pyramidal, four sided, tranverse section square, angles narrowly rounded and with a longitudinal groove. The sides are flat, or nearly so, with a median line. The tranverse grooves are concave in the bottom, and meet on the median line at an angle of 160° or 170°. The ridges between the grooves are minutely rounded on their edges, sometimes obscurely nodulose, and occasionally divided by a fine impressed line. These characters are all seen on different parts of the some specimen. There are six ridges, and the same number of grooves in the length of one line. The longitudinal striæ diverge outwards from the median line towards the angles in their course towards the aperture at an angle of 15 to 25. They are obscurely developed but still distinctly visible when the surface is well preserved. There are from fifteen to twenty of these striæ in the width of one line. Length of best preserved specimen 24 lines; width of the sides at the aperture 6 lines. This species is certainly closely allied to *C. Trentonensis*, Hall, from which it only differs in having more numerous longitudinal striæ. Charleton Point; H. R. J. Richardson.

C. ASPERATA, n. sp.—This species when perfect is most probably like *C. splendida*, an elongated four-sided pyramid. The only specimen collected is compressed so that the tranverse section is elliptical or rather rhomboidal. There are four grooves corresponding to those on the angles, and four median lines. The tranverse elevated striæ and grooves cross the median lines at an angle of about 170°. The grooves appear to be sub-angular in the bottom, but owing to the condition of the specimen this is not certain.

The striæ have their edges serrated with small conical tubercles, of which there are six or seven in the length of one line. Length of the specimen 19 lines; width at the larger extremity 18 lines; thickness 8 lines; width of the smaller extremity 7 lines; thickness 4½ lines. Near the smaller extremity there are nine transverse ridges and grooves, in two lines, but at the larger there are twelve in the same space. Macasty Bay; H. R. T. C. Weston.

Genus PTEROTHECA, Salter.

P. TRANSVERSA, Emmons. Macasty Bay; H. R. Also Gamache Bay; Div. 1, A. G.

CEPHALOPODA.

Genus ORTHOCERAS, Breynius.

O. ANTICOSTIENSE, B., Rep. 1857, p. 316.—Charleton Point and various localities at the westerly end of the Island; H. R. This species also occurs abundantly at Lake St. John on the River Saguenay; H. R.

O. FORMOSUM, B., op. cit., p. 317.—English Head; H. R. Also at Junction Cliff; Div. 1, A. G., and on the island of Montreal in the Trenton limestone.

O. XIPHIAS, B., op. cit., p. 318.—Cliffs east of English Head; H. R. Also at the City of Ottawa in the Trenton limestone.

O. BALTEATUM, B., op. cit., p. 318.—English Head; H. R.

O. FULGUR.= *O. propinquum*, B., op. cit., p. 320.—I have ascertained that Eichwald had described a species under the name of *O. propinquum* previously to 1857, and therefore, it is now proposed to name this as above. Charleton Point; H. R.

O. LYELLI, B., op. cit., p. 320.—Cliff east of Salmon River; H. R.

O. SEDGWICKI, B., op. cit., p. 320.—West-end; H. R. Also at Gamache Bay; Div. 1, A. G.

O. CROCUS.= *O. perannulatum*, B., op. cit., p. 319.—This latter name was proposed for an Orthoceras in 1843, by Portlock. I therefore beg to make the above alteration. West-end; H. R.

O. FERUM, n. sp.—Annulated, apparently tapering at the rate of one and a-half lines to the inch; section circular or nearly so; septa distant from each other about one-third of the diameter. The annulations are wide, gently convex, separated from each other by concave spaces equal to themselves (to the annulations) in width. The distance between the

summits of the annulations where the diameter of the fossil is 18 lines, is about 6 lines. Surface longitudinally marked with small ridges, of which there are four or five in the width of one line. One specimen from Junction Cliff which seems to belong to this species has a large and small set of longitudinal striæ, there being two or three of the smaller between each two of the larger. From certain indications, on the cast of one specimen, there would appear to be a set of fine engirdling striæ, but these may be appearances only. Siphuncle unknown. West-end; H. R. Also, Junction Cliff; Div. 1, A. G. T. C. Weston.

O. MAGNISULCATUM, B., op. cit., p. 330.—Charleton Point; H. R.

O. SIEBOLDI, n. sp.—Shell of medium size, subfusiform, tapering from the last chamber towards the apex at the rate of about twelve lines in a length of seven inches, in which space there are seventeen septa. Section apparently not quite circular. Siphuncle near the centre, small in passing through the septa, but dilated to the width of three lines in the chambers where the diameter of the shell is one inch. Length of the best preserved specimen 13 inches; length of chamber of habitation 6 inches; diameter of the last septum 30 lines; diameter at the aperture 24 lines. Surface unknown. Near the west-end Light-house; H. R. Also at Gamache Bay; Div. 1, A. G. T. C. Weston.

Genus ONCOCERAS, Hall.

O. CONSTRICTUM, Hall.—The specimens are slightly more slender and the septa rather more distant. It is probably a variety or at least a very closely allied species. Near the west-end Light-house; H. R.

Genus GOMPHOCERAS, Sowerby.

G. ? OBESUM, B., op. cit., p. 311.—Charleton Point and Macasty Bay; H. R.

Genus ASCOCERAS, Barrande.

A. CANADENSE, B., op. cit., p. 310.—English Head; H. R.

A. NEWBERRYI, B., Pal. Foss., vol. i, p. 164.—English Head; H. R. Also Junction Cliff; Div. 1, A. G. This species occurs on the south side of the St. Lawrence opposite Three Rivers; H. R.

Genus LITUITES, Breynius.

L. ? MAGNIFICUM.=*Gyroceras magnificum*, B. Rep. 1857, p. 307.

Genus NAUTILUS, Linnæus.

N. HERCULES, B., op. cit., p. 306.—Charleton Point; H. R.

Genus ASAPHUS, Brongniart.

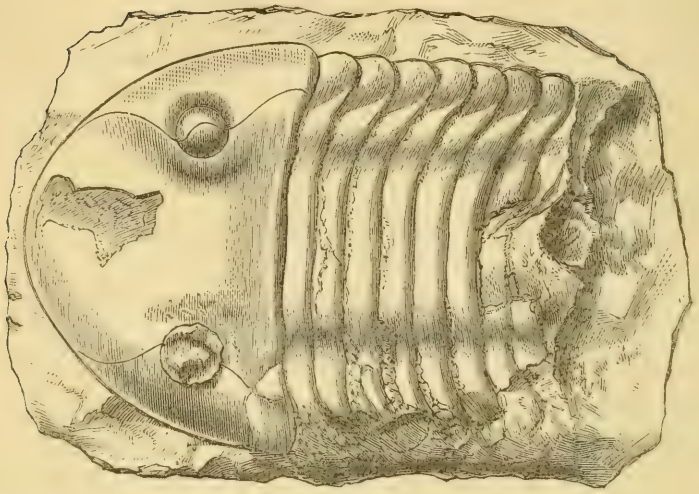

Fig. 7.

Fig. 7.—*Asaphus platycephalus*, from English Head.

A. PLATYCEPHALUS, Stokes.—Occurs in numerous localities on the north side and west end of the island. It is not easy to distinguish fragments of this species from such forms as *A. canalis*, *A. megistos*, and some others. We have, however, from English Head, a specimen with the head and the first six segments of the body perfectly preserved with the posterior angles of the cheeks clearly developed. I believe, also, that some detached pygidia from Gamache Bay in Div. 1, A. G., belong to this species.

A. NOTANS, n. sp.—Form ovate, broadly rounded at both extremities, pygidium obscurely trilobed, cheeks terminating in small spines. Head strongly convex, semi-elliptical or rather lunate uniformly rounded in front, the margin from a line crossing a little in front of the eye backwards to the points of the spines somewhat straight but sloping outwards. Eyes about one-third the whole length of the head and so situated that a line drawn across the head at the mid-length would touch their anterior angles. The terminal spines are acutely sub-conical, rounded on the inner side and with, apparently, a sharp edge on the outside ; they extend backwards to about the third pleura. Length of the head from the front to posterior margins in a straight line (or by callipers) a little less than half the width at the posterior margin and also about one-eighth less than the length of the thorax. The latter is distinctly trilobed, the axis moderately and uniformly convex and a little more than one-third the whole width. Pygidium moderately and uniformly convex, nearly a semicircle, its length a little more than half its width ; no concave groove round the margin ; the

axis obscurely indicated, quite obsolete at two-thirds the length ; side-lobes with a few obscure indications of lateral furrows.

Length of the largest specimen collected 31 lines; width at the fourth pleura about 20 lines ; length of the head from the front to the posterior margin in a straight line 10 lines ; length of the same following the curve 12 lines ; width at the base of the spines 23 lines ; length of the thorax 12 lines ; length of the pygidium 11½ lines ; width of the same 18½ lines.

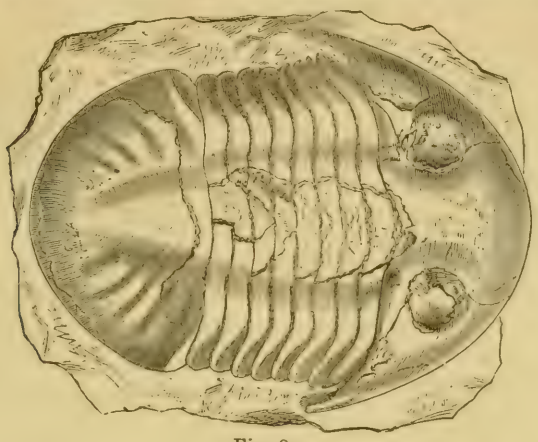

Fig. 8.

Fig. 8.—*Asaphus notans*.—A specimen from English Head.

The specimen figured (which is intended to be the type) has the crust removed from the greater part of the head and the eyes broken off. But another specimen about 18 lines in length has the head perfect with the exception of the posterior angles of the cheeks. It was found in the same locality with the large one, and appears to be certainly the same species. The eye of this specimen is truncato-conical, rising vertically (to the horizontal plane of the body) to the height of a little more than one line ; the summit is irregularly rounded, most elevated near the posterior side ; on the inside the surface slopes with a gentle curve, and gradually merges into the general surface. Examined microscopically the visual surface is seen to be smoooth and transparent, showing, beneath, a vast number of lenses arranged in both vertical and oblique lines. The facial suture in proceeding from the eye to the front margin has the usual sigmoid curve, but for about one-half its course in the middle of the margin it runs along the extreme edge ; not a little within the edge as is usual in species of this genus. The surface is apparently smooth, but when magnified seems to be obscurely wrinkled. Length of the head in a straight line a little more than 5 lines ; length of the thorax 6 lines ; length of the eye about 1½ lines. The anterior angles of the eye are at the mid-length of the head, and the posterior about 1 line from the margin.

This species somewhat resembles *A. megistos*, Locke, figured in the (Trans. Am. Ass. Geols and Nats. 1853, pl. VI.) But according to that figure the eye of *A. megistos* is about one-sixth the length of the head; a line drawn across the head at the mid-length is more than the length of the eye distant from the anterior angles of that organ; the head is one-ninth longer than the thorax. There are other differences, but these are the more important.

This species occurs at English Head; H. R. Also, at Gamache Bay in Div. 1., A. G. T. C. Weston.

A. ALACER, n. sp.—This species is ovate, broadly rounded at both extremities, (pygidium obscurely or not at all trilobed?) Cheeks without terminal spines. Head convex, semi-elliptical or lunate, uniformly rounded in front, gently convex at the sides; angles acutely rounded; length, by callipers, to the width in the proportion of four to seven. Eyes annular, abruptly elevated on the outside, flat or gently convex on the top, scarcely rising so high as the glabellar space between them; their length is to that of the head in the proportion of three to eight; their anterior angles reach the mid-length of the head. The rows of lenses, seen under the transparent cornea, cross each other diagonally, both sets being oblique. Thorax distinctly trilobed, axis moderately convex more than one-third the whole width. Pygidium depressed convex, semielliptical; margin broadly rounded; length to the width in the proportion of 3¾ to 6¾. Surface apparently smooth.

The specimen is a small rolled up individual, perfect with the exception of the central part of the pygidium where it is worn so that the characters of the axis cannot be made out.

Fig. 9.

Fig. 9.—*a*, front view of the head of *A. alacer; b*, front view of the head of *A. platycephalus*.

This species differs from *A. notans*, in the absence of cheek-spines, in the form of the eyes and also in their elevation. In the former they are so much elevated that viewing the head directly in front, the outline between them is concave; in the latter slightly convex. In this latter respect also it differs from *A. platycephalus*.

It occurs at Charleton Point; H. R. J. Richardson.

A. MEGISTOS, Locke.—Fragments of a large trilobite either identical or closely allied to this species occur at numerous localities on the north

and west coasts of the island; H. R. Also at Gamache Bay, in Div. 1, A. G. Both the pygidium and the head are proportionally more elongated than is represented in Locke's figure, but the eye occupies the same position. The margin has a concave depression all round just inside of the edge; the latter is bevelled. The central portion of the head is punctate, but a space around the margin is covered with fissure-like striæ. There are fragments which indicate a length of two feet.

Genus Illænus, Dalman.

I. orbicaudatus, B., Can. Nat. Geol., iv, p. 379. This species was found by T. C. Weston in 1865 at English Head; H. R. It occurs also at Gamache Bay and S. W. Point; Divs. 1 and 4, A. G. A specimen with the head, thorax, and pygidium in connection, but a good deal worn, was collected by Weston at Gamache Bay. It is figured below.

I. grandis, B., Can. Nat. Geol., iv, p. 380. Charleton Point; H. R. Also at Gamache Bay and S. W. Point; Divs. 1 and 4, A. G.

Genus Dalmanites, Emmrich.

D. callicephalus, Hall.—Charleton Point, English Head and West-end; H. R.

Genus Cheirurus, Beyrich.

C. pleurexanthemus, Green.—Occurs at numerous localities on the north and west coasts; H. R. Also at Gamache Bay; Div. 1, A. G.

C. Icarus, B., Can. Nat. Geol., v. 67. Charleton Point, English Head, and Macasty Bay; H. R.

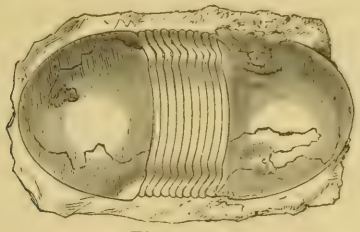

Fig. 10.

Fig. 11.

Fig. 10.—*Illœnus orbicaudatus*—A specimen from English Head.
Fig. 11.—*Cheirurus Numitor.*—Part of the head of this species.

C. Numitor, n. sp.—Glabella (that portion of it in front of the neck-furrow) sub-circular or sub-quadrate, the front somewhat straight or gently convex; the front angles narrowly rounded; sides broadly rounded, the greatest width about the mid-length. There are three pairs of glabellar furrows all deeply impressed but not extending inwards more than one-

fourth the width. The first pair enter just behind the anterior angles, and extend inwards and backwards at an angle of about 45 deg. with the longitudinal axis. The second pair are at about the mid-length, not so deep as the first, extending inwards nearly at a right angle but still curving a little backwards. The third pair are situated at about one-fourth the length from the neck-furrow; they are like the second, but seem to be deeper inwards. The glabella is strongly convex, nearly hemispherical, greatest elevation on a line with middle pair of furrows. A short stout spine rises from the back part, just between the two posterior glabellar lobes and behind the last pair of furrows. It extends nearly horizontally backwards, but sloping a little upwards. Fixed cheeks tumid; the eyes are small and about opposite or a little in advance of the second pair of furrows. Posterior margin of head, neck segment, movable cheeks and all other parts unknown. Length of glabella from the neck-furrow to the front margin 4 lines; greatest width about the same; distance of the eye from the side of the glabella 2 lines. Surface coarsely tuberculated.

This species is allied to *Sphærexochus cephaloceras*, Nieskowski, but has the glabella more nearly circular and the spine more elevated. It differs too widely from *C. perforator*, *C. Glaucus*, and *C. Satyrus*, B., Pal. Foss., to need comparison. English Head; H. R.

Genus Proetus, Steininger.

P. Alaricus, B., Can. Nat. Geol. v. 68, Charleton Point and English Head; H. R.

Genus Harpes, Goldfuss.

H. Ottawaensis, B., Pal. Foss., vol. i, p. 182, English Head and Wreck Point; H. R. The specimens are imperfect, and although the upper parts of the cheeks are not so densely punctate, yet, as the proportions are precisely the same as those of the typical specimen from the Trenton limestone, it seems the better course to refer them to this species for the present.

Genus Calymene, Brongniart.

C. Blumenbachii, Brongniart.—Charleton Point; H. R. Also in Divs. 1, 2, 3, 4, A. G.

Genus Leperditia, Roualt.

L. Canadensis, Jones.—Occurs at Charleton Point; H. R. The variety *L. Anticostinia* is found at East Point; Div. 3, A. G.

Catalogue of the Fossils of the Anticosti Group with Descriptions of some of the Species.

The Anticosti Group occupies all of the south shore of the island, with the exception of a small portion at the west end lying west of Gamache Bay,—the east end, and also about fourteen miles of the north coast between the east end and Fox Point. They consist of argillaceous and pure limestones with some interstratified shale fossilliferous throughout. In the Geology of Canada they are described as consisting of four divisions, of which the thickness of each is as follows:

Division	4.	Thickness	69 feet.
"	3.	"	540 "
"	2.	"	447 "
"	1.	"	306 "
			1362

Descriptive sections of these rocks will be found in the work cited, p. 298-304.

PROTOZOA.

Genus Receptaculites, Defrance.

R ? insularis, n. sp.—The specimen is a small cylindro-conical body 16 lines in length, 6 lines in diameter at the larger extremity, and 4 lines at the smaller where it is broken off. The larger extremity has the edges obtusely rounded and a shallow depression in the centre. The outer integument, or ectorhin, consist of small rough, convex, rhomboidal plates, the greater diagonal of which is $\frac{1}{8}$ of a line and the lesser $\frac{1}{4}$ of a line. They are arranged (on the larger extremity where alone they are preserved) in spiral rows crossing each other as in the ordinary forms of the genus. There seems to be a small rough pore at each point where the angles of four plates meet. Where the ectorhin is removed, the cast of the inner surface of the integument is covered with small round pits, the relation of which to the plates cannot be clearly made out. It is clear that they must correspond either to the depression at the angles of the plates or to a small protuberance on the centre of the underside of each plate. In the latter case they would represent the tubes of a true *Receptaculites*. The integument is rendered cellular by numerous small flat canals, some of which run horizontally in a direction round the cylinder but none continuous, perhaps only from one plate to another. Some of them seem to have a longitudinal course transverse to that of the others, but their relations to each other or to the plates cannot be made out. In one place there appear to be two integuments,—an ectorhin and endorhin, but elsewhere only one.

This fossil evidently belongs to a genus quite distinct from *Receptaculites*, but of the same family. It appears to be congeneric with *Tetragonis sulcata*. Eichwald, Lethæa Rossica, p. 432, pl. XXVII, fig. 5.

I would refer it to *Tetragonis* provided *T. sulcata* were accepted as the type of that genus, an arrangement hardly to be expected while the laws of scientific nomenclature continue to be construed as they are at present. Should *T. Murchisoni* turn out to be a true *Receptaculites*, then, according to the most widely approved mode of disposing of such questions, *Tetragonis* must be suppressed, and remain forever afterwards a natural history incumbrance in the shape of a synonym. It would be the better course to retain the name with *T. sulcata* as the type, In the meantime I shall place this species in *Receptaculites* provisionally. The specimen was found at Gamache Bay; Div. 1, A. G. T. C. Weston.

ZOOPHYTA.

Genus Heliolites, Dana.

Fig. 12.

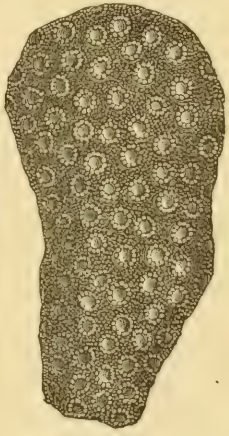

Fig. 13.

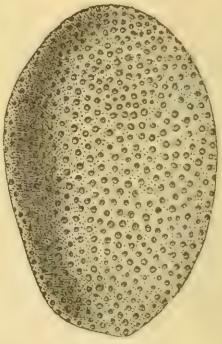

Fig. 14.

Fig. 12.—*Heliolites affinis.*
" 13.— " *speciosus.*
" 14.— " *exiguus.*

H. affinis, B., (ante, p. 5.)—White Cliff, Junction Cliff, Wall's Cove, South Point, and other localities; Divs. 1, 2 and 3, A. G. Also H. R.

H. speciosus, B., Can. Nat. Geol. [2] vol. ii, p. 426.—Corallum clavato-turbinate or sub-pyriform; cells a little more than one line in diameter, on an average, usually about half their width distant from each other, but occasionally in contact and sometimes more widely separated; their margins thin, elevated above the general surface, crenulated or orna-

mented with twelve small rough tubercles. The septa seem to be only incipiently developed, but they can be distinctly seen in the inside of the cup as so many small vertical ridges; there appear to be twelve of them. The tabulæ are somewhat irregular, being either horizontal, oblique, flat, convex or concave, from two to four in one line. The cœnenchyma is composed of small vesicular cells from one-sixth to one-third of a line in diameter. The surface between the cells is, when perfectly preserved, covered with small rough tubercles. When the specimens are worn, the surface presents only the circular apertures of the cells, and is destitute of granulation.

Only six specimens of this species were collected, and they are all of the clavato-turbinate form. It is possible that hemispherical or globular colonies may exist, as there is much variety in the form in species of this genus. Some of the cells are nearly two lines in diameter, others less than one line.

By the size of the cells this species is distinguished from all others of the genus except *H. megastoma* (McCoy) and *H. macrostylus* (Hall). From these it differs in the structure of the tissue between the tubes. In *H. megastoma* the cells of the cœnenchyma are arranged in polygonal columns. Such, also, seems to be their structure in *H. macrostylus*. The species which Edwards and Haime have placed in their genus *Lyellia* *L. Americana* and *L. glabra*, have the tubes rather more widely separated and the septa more strongly developed. Junction Cliff; Div. 1, A. G. T. C. Weston.

H. EXIGUUS, B., op. cit., p 428.—Cells about half a line in diameter and somewhat more than their own width distant from each other, with thin elevated margins, apparently not crenulated. Septa not visible in the only specimen collected. Tabulæ numerous, four to six in one line. Cœnenchyma minutely vesicular.

As the specimen is somewhat worn, it is possible that the margins of the cells when perfect may be crenulated. The cœnenchyma appears to be vesicular, but more specimens are required to decide this point.

This species on account of the small size of the cells and their greater proportional distance from each other, seems to be distinct from all the others. Gamache Bay; Div. 1, A. G. T. C. Weston.

H. SPARSUS, B., op. cit., p. 428.—Cells varying from half a line to one line in diameter, distant from one to three lines from each other. Radiating septa much developed, sometimes meeting in the centre. The cœnenchyma varies in structure, being in some places entirely vesicular, and elsewhere composed of vertical series of square cells as in *H. megastoma*. These variations are seen in the same specimen. Chicotte River; Div. 4, A. G. J. Richardson.

H. TENUIS, B., op. cit., p. 428.—Cells, in general, a little less than half a line in diameter, and half their own width distant. The walls are excessively thin and rarely distinguishable, not forming a distinct ring as in the others above described. Cœnenchyma, as seen upon the surface, composed of minute polygonal cells. This species may, perhaps, belong to the genus *Protarœa*. Gamache Bay; Div. 1, A. G. T. C. Weston.

Genus FAVOSITES, Lamarck.

F. PROLIFICUS, B., (ante, p. 6.)—Occurs in numerous localities throughout the island; Div. 1, 2, 3, 4, A. G. Also in the H. R.

F. GOTHLANDICA, Lamarck.—A species which cannot be (without comparison with specimens from the locality of the type) distinguished from this occurs throughout Divs. 2 3, and 4, A. G.

F. FAVOSA, Goldfuss.—The Jumpers, Div. 4, A. G.

Genus STENOPORA, Lonsdale.

S. FIBROSA.—Occurs throughout Divs. 1, 2, 3 and 4, A. G. Also in the H. R.

S. BULBOSA, B., op. cit., p. 429.—This species is found in small globular or sub pyriform masses from six to thirty lines in diameter. There is often a small shell buried in the base. The tubes are about the size of those of *S. petropolitana*. Gamache Bay, Div. 1, A. G. T. C. Weston.

Genus HALYSITES, Fischer.

H. CATENULATUS, Linnæus.—Occurs in numerous localities throughout Div. 1, 2, 3, and 4, A. G. Also in the H. R.

Genus CALAPŒCIA, Billings.

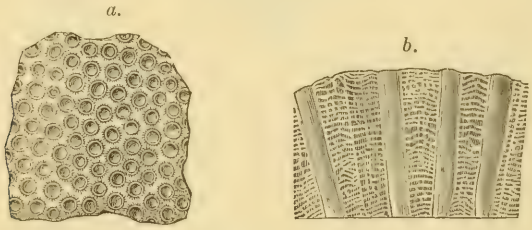

Fig. 15.

Fig. 15.—*Calapœcia Anticostiensis.*—*a*, portion of the surface; *b*, a vertical polished section.

C. ANTICOSTIENSIS, B., op. cit., p. 426.—Corallum forming depressed hemispheric masses. Corallites a little more than one line in diameter with smaller ones between them, sometimes in contact, but, in general, dis-

tant from one-fourth to one-half their diameter. Costæ forming a fringe around the apertures and also seen in vertical polished sections. Intercellular tissue composed principally of thin, undulating or flat horizontal diaphragms extending from tube to tube and subdivided into square cells by the costæ at the surface of the walls. Tabulæ obscurely seen, in the specimens observed, apparently very thin. There are about three diaphragms and tabulæ in one line. The radiating septa form thin, sharp, strong, elevated striæ on the inside of the tubes where exposed in weathered specimens. West side of Gamache Bay; Div. 1, A. G.* T. C. Weston.

Genus ALVEOLITES, Lamarck.

A. LABECHEI, Edwards and Haime.—Occurs abundantly at South-west Point and the Jumpers; Div. 4, A. G.

Genus PETRAIA, Munster.

P. SELECTA, B., (ante, p. 7.)—Gamache Bay; Div. 1, A. G. Also in the H. R.

P. PULCHELLA, B., op. cit., p. 424.—The two specimens on which this species is founded are acutely pointed and moderately curved. The following are their dimensions. One of them is nine lines in length and six and a-half in diameter at the margin of the cup. The other is ten lines in length and seven in diameter. There are about sixty septa in each. In a polished longitudinal section, the cup is found to extend about half the length of the whole fossil downwards and to have a conical elevation in the centre. The septa, above the bottom of the cup extend inwards about one line, gradually diminishing in height to the margin. Junction Cliff and White Cliff; Div. 1, A. G.

P. PYGMEA, B., Pal. Foss,, vol. i, p. 103.—Challoupe River; Div. 4, A. G.

P. LATUSCULA, B., op. cit., p. 104.—Walls Cove, East Point, and the Jumpers; Div. 2, 3, 4, A. G.

Genus ZAPHRENTIS, Rafinesque.

Z. PATENS, B., Can. Nat. Geol., [2,] vol. ii, p. 430.—The specimen is broken off at nine lines below the margin of the cup. Diameter of the lower extremity, twenty-one lines, and of the cup at the margin, thirty-three lines. It thus expands, in this part, one inch in a length of nine lines. It may have been more cylindrical below. In the cup there are

* This species appears to be congeneric with *Syringophyllum organum—Sarcinula organum*. Should this view turn out to be correct, then the generic name must, of course, be changed.

thirty-six large septa nearly three lines apart at the margin. Between these are thirty-six smaller ones, which are scarcely half a line in height, and have their edges serrated with small denticulations about three in one line. There is a deep septal fossette on one side. Surface and lower parts unknown. Cormorant Point; Div. 3, A. G. J. Richardson.

Z. AFFINIS, B., op. cit., p. 430.—Wreck Point and White Cliff; Div. 1, A. G. Also in H. R.

Z. STOKESI, Edwards & Haime.—The Jumpers; Div. 4, A. G.

Z. BELLISTRIATA, B., op. cit., p. 430., ante, p.—Numerous localities in Div. 1, 2, A. G. Also in H. R.

Genus CYATHOPHYLLUM, Goldfuss.

C. WAHLENBERGI, B., Pal. Foss., vol. i, p. 108.—East Point; Div. 3, A. G.

C. PELAGICUM, B., op. cit., p. 108.—Becsie River Bay; Div. 2, A. G.

C. ANTICOSTIENSE, B., op. cit., p. 109.—South-west Point; Div. 4. A. G.

C. EURYONE, B., op. cit., p. 110.—The Jumpers; Div. 4, A. G.

Genus PTYCHOPHYLLUM, Edwards and Haime.

P. CANADENSE, B., op. cit. p. 107.—South-west Point, Div. 4, A. G.

Genus STROMBODES, Schweigger.

S. DIFFLUENS, Edwards and Haime.—South-west Point; Div. 4, A. G.

Genus BETRICEA, Billings.

B. UNDULATA, B. Rep. 1857, p. 344.—Gamache Bay; Div. 1, A. G. Abundant in numerous localities on the north and west coasts of the island; H. R.

ECHINODERMATA.

Crinoidal remains occur throughout, but very abundantly in Div. 4. They are always in fragments, and none have been found sufficiently perfect to afford the means of determining even the genus.

POLYZOA.

Genus PTILODICTYA, Lonsdale.

P. FRAGILIS, B., (ante p. 9.)—Junction Cliff; Div. 1, A. G.

P. EXCELLENS, n. sp.—Polyzoary consisting of small flattened, two-edged branches which are gently and uniformly convex along the middle

for two-thirds of the width and somewhat flat along the edges. Cells oblong-ovate, the sides usually straight and the ends very obtusely rounded with strongly elevated lines between the rows; six or seven cells in the length of one line and eight or nine in the same space in width. At their extremities the cells are not in contact, but separated about one-fourth their own length from each other; the intervening space with two small pits. On each side of the branches there is a row of cells which are larger and more nearly circular than the others. The most complete specimen collected is 13 lines in length and 1½ lines in width. It is twice branched at an angle of about 35°.

The most important distinctive character of this species is the pitted structure of the space which intervenes between the ends of the cells. A small portion along the edge is often smooth and the edge itself usually acute. It occurs at East Point, two miles east of Jupiter River, Gamache Bay, and the Jumpers; Divs. 1, 2, 3, 4, A. G. J. Richardson.

P. SULCATA, n. sp.—Polyzoary elongate, flattened, sides gently and uniformly convex with moderately sharp edges. Cells broad-ovate or nearly square, about eight in the length of one line and nine or ten in the same space in width, their ends separated by a simple wall only; a fine sometimes flexuous impressed line or minute furrrow runs along the crest of the walls which separate the longitudinal rows. When the specimens are slightly worn this furrow disappears. All the individuals collected are simple and slightly curved, and it seems probable therefore that this is an unbranched species. The largest observed is 2 inches in length and 2 lines in its greatest width at a point where there are 20 longitudinal rows of cells. Another is 18 lines in length and 2¼ lines in its greatest width where there are 22 rows of cells. In this latter specimen many of the cells have a small wall-like projection or imperfect septum extending from the side, the end, or one of the angles, obliquely nearly to the centre. Rarely there are two of these septa in a cell.

This species in its simple unbranched and curved form closely resembles *P. gladiola*, but the cells are more nearly square and the branches not angular along the middle. The sulcus between the rows of cells is a character not observed in *P. gladiola*. The Jumpers; Div. 4, A. G. J. Richardson.

P. SUBERBA.—Polyzoary consisting of large fronds, sometimes three or four inches in length and one or two inches in width. Cells ovate, about eight in the length of one line and ten in the same space in width. In some parts of the frond they are arranged in longitudinal rows, but elsewhere irregularly disposed. In the rows the cells are not in contact at their extremities but separated by one or two small pits as in *P. excellens*.

Wall's Cove and Beesie River Bay; Div. 1, A. G. J. Richardson, T. C. Weston.

P. RUSTICA, n.sp.—Polyzoary consisting of small flattened, branching fronds with the sides gently and uniformly convex. Cells ovate, with a slightly elevated margin and a fine raised line between the rows, three or four in the length of one line and about six in the same space in width. When the surface is worn the margins of the cells and the lines between the rows totally disappear. The specimen examined is 13 lines in length and 1½ lines in its greatest width where there are eight rows of cells. It gives off three branches at an angle of about 45°. The Jumpers; Div. 4, A. G. J. Richardson.

P. TENERA, n. sp.—Polyzoary consisting of narrow flattened branching fronds with the sides gently and uniformly convex. Cells ovate with a thin elevated margin; an obscure elevated flexuous line between each two rows. There are about five cells in the length of one line and eight in the same space in width. The edges of the fronds are moderately acute. The length of the cells is about one-third greater than their width. In perfectly preserved specimens the surface between the cells seems to be minutely tuberculated. The fronds are, in general, a little over one line in width with about ten rows of cells. Point Laframboise and Gamache Bay; Div. 1, A. G. J. Richardson.

P. ARGUTA, n. sp.—Polyzoary of narrow, branching rather strongly convex fronds. Cells oblong-ovate, about four in the length of one line and eight or nine in the same space in width. One specimen is nearly a line wide with eight rows of cells; another half a line with four rows. Cape Sand Top Bay; Div. 2, A. G. J. Richardson.

P. ALCYONE, n. sp.—The polyzoary of this species resembles that of *P. rustica*, but differs in having the cells more nearly circular and smaller, there being, on an average, ten or eleven in the length of two lines. Two miles west of Chicotte River; Div. 4, A. G. J. Richardson.

Genus HELOPORA, Hall.

"Simple or branching cylindrical stems, often swelling at the upper extremity, poriferous on all sides; pores oval or subangular, arranged between longitudinal elevated lines." (Pal. N. Y., v. 2, p. 44).

Some of the following species do not come exactly within the above description, but as there are intermediate connecting forms I do not think it necessary to institute a new generic group for their reception. Eichwald places these fossils in *Vincularia*, apparently without sufficient reason.

H. LINEATA, n. sp.—Polyzoary apparently hexagonal, less than half a line in thickness and rarely an inch in length, sometimes branched, the branches

as large as the main stem. Cells ovate, uniformly rounded at both ends, their length about one-half greater than their width, a distinctly elevated margin all round, arranged in straight rows running from end to end of the stipe; the rows separated by a fine, flexuous filiform ridge which has a distinct groove on each side between it and the cells; from five to seven of the latter in the length of one line.

The surface occupied by each row of cells is flat, and consequently there, are as many sides to the stipe as there are rows. In the specimens upon which the above description is founded there appear to be six sides but as, they are all fixed to the rock the precise number cannot be determined with certainty. There are numerous small specimens mixed up among the others on the same slabs some of which have certainly only four sides while others appear to have five. None of them are sufficiently perfect to show whether they possess the lines between the rows of cells on the sides. The least wearing removes these characters, and I cannot at present decide whether they should be referred to this or to one or more other species. Junction Cliff; Div. 1, A. G. J. Richardson.

H. FORMOSA.—Polyzoary about one-fifth of a line in thickness and less than an inch in length, apparently four sided. Cells elongate ovate, their ends narrowly rounded; length about twice the width, an elevated margin at the sides which does not seem to go round the ends; eight to ten in the length of two lines. There are four rows separated by a fine filiform ridge with a groove on each side, and with four or five tubercles to the length of each cell situated on the crest of the ridge. East Point; Div. 2, A. G. J. Richardson.

H. CONCAVA.—Polyzoary apparently four-sided from one-sixth to one-third of a line in thickness. Cells elongate ovate, most deeply excavated at the lower extremity, the bottom gradually rising to the upper margin, which is scarcely distinct from the general surface. There are from five to eight cells in two lines. The angles of the stem are prominent and distinctly defined, sometimes nodulose, the celluliferous faces concave when perfect, but when the angles are worn off they appear to be flat. Two miles East of Jupiter River, East Point and at various other localities in Divs. 2 and 3, A. G. J. Richardson.

H. STRIGOSA.—Polyzoary sub-polygonal, from one-fourth to one-half of a line in thickness, less than an inch in length, branched. Cells ovate, length about one-third greater than their width, arranged in longitudinal rows, with an elevated margin which is occasionally obsolete at either one or at both ends of the cell, but almost always well developed at the sides thereof. The distance of the cells from each other varies from $\frac{1}{3}$ to $\frac{3}{4}$ of a line. Length of the cells about $\frac{1}{4}$ of a line. There appear to be four or

five rows of cells. Surface longitudinally striated. Where the stem gives off a branch the latter is sometimes at its base, cylindrical, destitute of cells and strongly striated for the length of about one line. Junction Cliff, Anticosti; Div. 1, A. G. J. Richardson.

H. NODOSA.—Polyzoary rudely cylindrical; cells elongate ovate, one end rounded and deeply impressed, the other pointed or minutely truncated and scarcely distinct from the surface; an elevated tubercle between each two cells which appears to have often a rounded pit in its apex. This gives to the stems a nodose appearance. There are three or four cells in the length of one line, and they seem to be arranged in five or six longitudinal rows. Two miles east of Jupiter River and at East River; Divis. 2, 3, A. G. J. Richardson.

H. LINEOPORA.—Polyzoary cylindrical, sometimes branched, about one-third of a line in thickness and from three to eight lines in length, the surface covered with minute extremely elongated cells which are most deeply impressed at their lower extremities. Under the microscope the surface appears to be simply striatted longitudinally and without cells; but on further examination what appear to be striæ are in fact the cells. This species might perhaps form the type of a new genus. Two miles east of Jupiter River; Div. 3. A. G. J. Richardson.

H. ARMATA.—Polyzoary from one-fourth to one-third of a line in thickness. Cells sub-ovate with a strongly projecting broad based spine at the lower edge. This spine appears to be concave on the upper side where it receives the cell, and convex on the lower side. There appear to be four or five longitudinal rows of the cells, and they also sometimes form transverse bands around the stem; in other instances those of contiguous rows alternate with each other. On a side view the spines are triangular in outline, the upper side projecting either straight outwards at a right angle or curving slightly upwards; the lower side sloping downwards from the point of the spine with a concave descent which extends half way to the cell next below. There are about three cells in the length of one line, and they are distant rather more than their own length from each other. The surface of the stem is longitudinally striated. East Point, Anticosti; Div. 2, A. G. J. Richardson.

H. BELLULA.—Polyzoary consisting of small, straight, cylindrical stems of nearly uniform thickness, but usually tapering slightly from the upper to the lower extremity, celluliferous all round. Cells elliptical; the proportional length and width somewhat variable, the latter usually one-fourth less than the former; the margin, at the sides, thin and distinctly elevated; a spine or tubercle at the lower end which has the form of a small four-sided pyramid, the upper side often at right angles, and sometimes sloping

a little upwards, so as to bring the apex over the cell. The cells are usually arranged in longitudinal rows running the whole length of the stem, sometimes separated throughout, often in contact. In specimens where the cells of contiguous rows alternate with each other there is also a distinct oblique transverse arrangement, the cells then appearing to be rhomboidal (although they are not so.) When the rows are separated from each other there is a distinct longitudinal groove between each two but no elevated line as there is in *H. lineata*. When the cells are in contact laterally the groove is broken up into a series of small triangular or rhomboidal pits, the former occurring in cases where the cells alternate and the latter where they touch each other at the mid-length. The lower extremity is usually striated for the distance of half a line, and seems to terminate in an obtuse point. The upper extremity is in general abruptly truncated; specimens with this part rounded sometimes occur, but it is not certain that such is the natural form. When the cells are closely crowded together they become irregularly polygonal. There are from six to eight cells in the length of one line, and from eight to fourteen rows. Length from two to ten lines, the shorter specimens being evidently, in most instances, fragments; diameter from half to two-thirds of a line. East Point, two miles east of Jupiter River, South Point and many other localities on the south and east sides of Anticosti; Divs. 2, 3, A. G. J. Richardson.

H. STRIATOPORA.—The only specimen collected, of this species, is a cylindrical branched polyzoary seven lines in length and half a-line in diameter. In the lower half there are a few widely separated nearly circular cells about one-tenth of a line in width each, with an obscurely elevated margin. The remainder of the surface is without cells but covered with fine somewhat irregular longitudinal striæ. Four miles west of South West Point, Anticosti; Div. 3, A. G. J. Richardson.

H. IRREGULARIS.—Polyzoary irregularly cylindrical branched with, occasionally, some bulbous enlargements. Cells sub-circular about one twenty-fifth of a line in diameter and their own width separate from each other, the margin obscurely salient. The stems and branches are from one to three lines in diameter, and have a superficial resemblance to small specimens of *Stenopora fibrosa*. Challoupe Rivers, Anticosti: Div. 3, A. G. J. Richardson.

H. CIRCE.—Polyzoary cylindrical, branched, hollow. Cells sub-ovate or sub-circular, in contact with each other or nearly so, from eight to eleven in the length of one line. The specimen is nearly a line in diameter and three lines in length; it is a branched fragment. Two miles east of Jupiter River, Anticosti; Div. 3, A. G. J. Richardson.

H. VARIPORA.—Polyzoary cylindrical, branched, hollow. Cells polygonal or circular, varying greatly in size in the same stem; usually those of the maximum size most numerous; the smaller ones in the angles between the larger. This species differs from *H. Circe* in never having the cells ovate. The stems are from half-a line to three lines in diameter, and there are from seven to ten cells in the length of one line. It ranges through Divisions 1, 2 and 3; Anticosti Group, and occurs at Junction Cliff, East Point, two miles east of Jupiter River and other localities on the south and east side of the Island; Divs. 1, 2, 3, A. G. J. Richardson.

Genus LINGULA, Brugière.

L. INSULARIS, n. sp.—Sub-pentagonal or sub-ovate; greatest width about the mid-length, thence uniformly tapering with a gently convex slope to the beak; about two-thirds of the front margin straight; anterior angles narrowly rounded; thence gradually widening to the mid-length. Both valves are rather strongly convex, most gibbous about the middle; the anterior half with a flat slope to the front margin. Surface with fine concentric striæ. Length 6½ lines; width at the mid-length 5 lines; depth of both valves in the middle 2½ lines. A single specimen only was collected, and that is somewhat imperfect. White Cliff, Gamache Bay, Anticosti; Divs. 1, A. G. T. C. Weston.

L. QUADRATA, Eichwald.—Junction Cliff; Div. 1, A. G. Also Charleton Point and English Head; H. R.

L. FORBESI, B., Pal. Foss., vol. i, p. 115.—Junction Cliff; Div. 1, A. G. Also at English Head; H. R.

Genus STROPHOMENA, Rafinesque.

S. RHOMBOIDALIS, Wahlenberg.—Occurs at numerous localities on the South and East coasts of the island throughout Divs. 1, 2, 3, 4, A. G.

S. ALTERNATA, Conrad.—A variety of this species occurs throughout Divs. 1, 2, 3, 4, A. G. Also in H. R.

S. PECTEN, Linn.—Occurs throughout Divs. 1, 2, 3, 4, A. G.

S. CERES, B., Pal. Foss., vol. 1, p. 119.—A variety of this species occurs at Gamache Bay and other localities in Div. 1, 2, A. G. The typical form occurs at Charleton Point; H. R.

S. LEDA, B., op. cit., p. 129.—East Point; 3 A. G.

S. PHILOMELA, B., op cit., p. 122.—East Point, S. W. Point and the Jumpers; Div. 3, 4, A. G.

S. JULIA, B., op. cit., p. 127.— The Jumpers; Div. 4, A. G.

S. ANTIQUATA, Sowerby.—Prinsta Bay and East Point; Divs. 2, 3, A. G.

S. PLANUMBONA, Hall.—Junction Cliff; Div. 1, A. G. Also in H. R.

Genus LEPTAENA, Dalman.

S. SERICEA, Sowerby.—Very abundant and in a fine state of preservation at Gamache Bay; Div. 1, A. G. Also at numerous localities in the underlying H. R.

L. TRANSVERSALIS, Dalman.—Four miles west of Jupiter River, East Point and the Jumpers; Div. 2, 3, 4, A. G.

Genus ORTHIS, Dalman.

O. PORCATA, McCoy.—Abundant at Gamache Bay; Div. 1, A. G. This species also abounds in the Trenton limestone at the City of Ottawa.

O. DAVIDSONI, De Verneuil.—Abundant at the Jumpers and other localities in Div. 4, A. G.

O. LYNX, Eichwald.—Abundant at Gamache Bay; Div. 1, A. G. Also in H. R.

O. LAURENTINA, B., Rep. 1857, p. 297.—Abundant at Gamache Bay; Div. 1, A. G.

O. MARIA, B., Pal Foss., vol. i, p. 137.—Gamache Bay; Div. 1, A. G.

O. PARVA? Pander.—A species agreeing very nearly with the figures and descriptions of De Verneuil, Pal. Russ., occurs at Junction Cliff, Gamache Bay, the Jumpers and other localities in Divs. 1, 4.

O. MEDIA, Shaler.—The following is Mr. Shaler's description of this species. Bul. M. C. Z., p. 65.

"Shell orbicular; hinge-line one half less than width of shell. Toothed valve evenly convex; depth, in adult specimens about one fourth the height, in young specimens proportionately a little greater; umbo slightly elevated, rising above the hinge line one eighth the distance from beak to border, slightly compressed, occupying at the hinge-line about one fourth the diameter of the valve; beak small, distinct, slightly recurved, a little overhanging the area; area small, rather broad. Fissure triangular, one third as wide as length of hinge-line. Socket valve transversely flattened, a slight mesial depression dividing the surface into two lobations.

"Differs from its European representatives, being more orbicular, having less projecting umbo, less incurvation of beak, much finer radial striæ, closer approximation of the brachial supports of the socket-value, and less length of the adductor impressions in the same valve."

This species occurs at South Point, S. W. Point and the Jumpers; Div. 3, 4, A. G.

It is probably only a variety of *O. elegantula.*

O. UBERIS, B.=*O æquivalva*, Shaler, op. cit., p. 56.—I propose to change the name given by Mr. Shaler to this species as it is equivalent to *æquivalvis*, already applied by both Davidson and Hall to other forms of the genus. The following is the description in the work cited.

"Shell somewhat lenticular; one fifth wider than from beak to border; valves nearly equal in convexity; toothed valve a little the most prominent; hinge-line rather more than half the width of the shell. Toothed valve strongly evenly convex, a little depressed opposite the umbo; umbo rising above the hinge-line about one sixth the distance from beak to border, a little laterally compressed; beak minute, scarcely projecting beyond the hinge-line, a little recurved; area about twice as wide as that of socket valve; width one-sixth of length; steeply sloping; most convex point of valve a little nearer the beak than border. Socket-valve nearly evenly convex; very slight mesial depression, extending from the umbo to the centre of valve, where it fades out, and in succeeded by a slight ridge, which extends to the border, beak distinct; not rising as far above the hinge-linge as that of opposite valve by the width of socket-valve area. Surface with fine dichotomous striæ with interspaces as wide as the ridges."

Mr. Shaler, at the commencement of his description, says "(*Syn. Orthis hybrida*, BILLINGS.)" I cannot, however, discover in what publication I have designated this fossil by that name. It is most abundant at Junction Cliff but it occurs throughout Divs. 1, 2, 3, 4, A. G.

O. RHYNCHONELLIFORMIS, Shaler, op. cit., p. 66.—This is a variety of *O. uberis* with a short hinge-line and with a mesial sinus in the ventral valve of some of the individuals. It occurs most abundant at Gull Cape; Div. 2: more rarely 1 mile east of Jupiter River, Div. 3; The Jumpers, Div. 4, A. G.

O. RUIDA, n. sp.—Shell sub-lenticular, both valves moderately and nearly equally convex: hinge-line a little less than the whole width; sides and anterior angles irregularly rounded; front with a portion in the middle somewhat straight. Ventral valve with a strong broadly convex fold along the middle dying out on the umbo; on each side of the fold nearly flat; umbo small; area moderate, forming an obtuse angle with the plane of the lateral margin. Dorsal valve with a deep sub-angular sinus which tapers to a point at the beak; on each side of the sinus moderately convex; cardinal angles compressed; area small. Surface with small, rough, sub-angular ribs, several times divided before reaching the front; four or

five in two lines at the margin. There appear to be concentric striæ most distinct in the grooves between the ribs. Length 8 lines; width 10 lines; depth of both valves 4 lines. Gamache Bay; Div. 1, A. G. T. C. Weston.

Genus Orthisina, D'Orbigny.

O. Verneuili, Eichwald.—Gamache Bay; Div. 1, A. G. Also in several localities in the Trenton limestone in Canada West.

Genus Rhynchonella, Fischer.

R. glacialis, B., op. cit., p. 143.—Gull Cape; Div. 2, A. G.

R. fringilla, B., op. cit., p. 141.—Gull Cape; Div. 2, A. G.

R. Janea, n. sp.—Sub-ovate, apical angles about 80°; sides somewhat straight in the upper half, rounded in the lower half; about one-half of the front margin truncated or nearly straight. Ventral valve moderately convex; sinus deep and concave at the front, one-third the whole width, dying out near the umbo; sides of the sinus with one or two prominent ribs from which there is a somewhat flat slope to the margin; umbo prominent but narrow; beak elevated about half-a line above the hinge and moderately incurved; there appears to be a circular foramen beneath it. Dorsal valve more uniformly convex than the ventral; mesial fold dying out at about two-thirds the length. There are four angular ribs on the fold and three on the sinus; from six to eight on each side or from sixteen to twenty in all on each valve. Length 6 or 7 lines; greatest width about the same.

This species differs from *R. Anticostiensis* in having the beak more incurved. Gamache Bay; Div. 1, A. G. T. C. Weston.

R. nutrix, n. sp.—With the exception of the beak and a slight concavity in the front margin the outline of this shell, on a dorsal view, is nearly a perfect ellipse. In other respects it does not differ to any important extent from *R. Janea*. Width 8 lines; length 6 lines. Gamache Bay; Div. 1, A. G. T. C. Weston.

R? argentea, n. sp.—Shell transversely ovate or sub-globular, proportional length and breadth variable. Ventral valve strongly convex, most elevated about the middle; beak, apparently closely incurved; mesial sinus about one-third the whole width, dying out at the mid-length, abruptly elevating the margin of the opposite valve. Dorsal valve rather more strongly convex than the ventral; a narrow groove extending from the umbo towards the front most probably connected with an internal mesial septum; mesial fold short but strongly elevated, extending about half the length. Surface with numerous small ribs or, rather, striæ which appear to bifurcate, three or four in the width of one line. Shell, in exfoliated

specimens, of a greyish silvery lustre like that of *Atrypa reticularis*. Only two specimens were collected. The largest of these is 7 lines in width and 6 lines in length; depth of both valves 5 lines. The other is 5 lines in length and 5½ in width; depth of both valves 4 lines.

From the peculiar character of the shell I am inclined to think that this is not a true *Rhynchonella*.

Challoupe Rivers; Div. 4, A. G. J. Richardson.

R. PYRRHA.—Shell ovate or nearly circular; width usually a little greater than the length. Ventral valve rather strongly convex, most prominent at one-third the length from the beak; mesial sinus deep at the front margin and usually flat in the bottom, dying out on the umbo; the latter with a concave slope on each side to the cardinal angles and margin; beak small incurved but not in contact. Dorsal valve more uniformly convex than the ventral, a prominent mesial fold which becomes a sulcus on the umbo. There are about twenty ribs of which there are usually four in the mesial sinus. Width 5 or 6 lines; length a little less. One mile east of Otter River; Div. 2, A. G. J. Richardson.

R. VICINA, n. sp.—Shell ovate; sides in the anterior two-thirds uniformly rounded; above which they are somewhat straight and meet at the beak at an angle of 110°; front margin somewhat concave at the sinus. Ventral valve moderately convex, most prominent at the upper third, somewhat flattened or concave on each side of the umbo; the latter moderate; beak small rather closely incurved; sinus concave, dying out on the umbo. Dorsal valve moderately convex, the fold distinct but not abruptly elevated, dying out at the upper third. There are twelve strong angular ribs on the ventral valve, two of which, with a smaller one on the left side, are in the sinus. The same number on the dorsal valve, three of them on the fold. Length 6 lines; width 7 lines. South-west Point; Div. 4, A. G. J. Richardson.

A single specimen only was collected.

R. EVA.—Shell small, ovate; sides and front margin rounded; apical angle variable, from 90° to 120°. Ventral valve strongly convex along the middle; beak closely incurved: the sinus slightly developed. Along the median line there are usually three strong ribs, diverging towards the front, one of these in the sinus; outside of these three there are four or five smaller ones in each side. Dorsal valve somewhat broadly convex, a faint mesial sinus on the umbo which towards the front becomes a slightly elevated mesial fold with two strong ribs. In very perfect specimens, the front part is marked with fine zig-zag striæ. Length about 3 lines; width usually a little greater than the length. East Point; Div. 3, A. G. J. Richardson.

R. MICA, n. sp.—Shell small, transversely ovate or sub-circular. Ventral valve strongly convex, uniformly arched from beak to front, dichotomously

carinated along the middle, somewhat concave towards the sides; umbo laterally compressed; beak small, strongly incurved over the umbo of the dorsal valve but apparently not in contact therewith. There is a small sinus in this valve with a prominent ridge on each side which produces a doubly carinated aspect. The dorsal valve is more broadly and uniformly convex than the ventral with a shallow sinus, in the middle of which is a narrow mesial fold. Surface with from twenty to twenty-five small obscure radiating ribs which occur also on the carinæ of the ventral valve and the small fold in the sinus of the dorsal valve. Length about 3 lines; width about 3½ lines. This species is evidently congeneric with *R? recurvirostra*, Hall. The Jumpers; Div. 4, A. G. J. Richardson.

Genus Camerella, Billings.

C. reversa,=*Pentamerus reversus*, B. Rep. 1857, p. 295.—Junction Cliff; Div. 1, A. G.

C. Ops, B., Pal. Foss., vol. i, p. 148.—The Jumpers; Div. 4, A. G.

C. lenticularis, n. sp.—Shell ovate, lenticular, both valves about equally convex; sides and front rounded; greatest width a little above the mid-length; beaks about equal, closely incurved. On one valve there is an obscure mesial fold and on the other a sinus. Most of the specimens have a few obscure ribs half a line wide, but these are sometimes so slightly developed that the shell seems to have an even surface all over with the exception of the fold and sinus which are always more or less conspicuous. When the surface is very perfectly preserved fine concentric striæ are visible. Width of a specimen of the ordinary size 9 lines; length 8 lines; depth of both valves 4 lines. Reef Point; Div. 1, A. G. J. Richardson.

This species differs from *C. reversa* in its regularly lenticular form and less gibbosity. It appears in the same group of strata, but at a higher level.

Genus Pentamerus, Sowerby.

P. Barrandei, B., Rep. 1857, p. 296.—Becscie River Bay; Div. 2, A. G.

P. oblongus, Sowerby.—South-west Point, South Point, Cormorant Point, East Point and the Jumpers; Divs. 3, 4, A. G.

Genus Stricklandinia, Billings.

S. lens, Sowerby.—East of Jupiter River, South-west Point and The Jumpers; Divs. 3, 4, A. G.

S. lirata, Sowerby.—East Point, South-west Point, Heath Point and The Jumpers; Divs. 3, 4, A. G.

S. BREVIS, B., Can. Nat. Geol. vol. iv, p. 135.—South-west Point; Div. 4, A. G.

Genus ATRYPA, Dalman.

A. RETICULARIS, Linn.—Occurs throughout the Anticosti Group, but most abundant at South Point.

A. MARGINALIS, Dalman.—The specimens are in general more rotund and wider on the hinge line than those from Wenlock. Junction Cliff; Div. 1, A. G.

Genus ZYGOSPIRA, Hall.

Z. PAUPERA, n. sp.—Shell small, ovate, width greater than the length; sides nearly uniformly rounded; front margin gently convex or with a portion in the middle sometimes slightly concave, straight, or gently projecting. Ventral valve convex, regularly arched from beak to front, concave towards the cardinal angles and sides; beak small, closely incurved. Dorsal valve gently convex with a very wide concave mesial sinus dying out near the umbo; compressed at the cardinal angles. Surface with about twenty-five small angular ribs. Width 4 lines; length 3 lines. Near Jupiter River; Div. 3, A. G. J. Richardson.

This species closely resembles *Z. Modesta*, the type of the genus, but is smaller.

Genus ATHYRIS, McCoy.

A. UMBONATA, B., Pal. Foss., vol. i, p. 144. Junction Cliff; Div. 1, A. G.

A. PRINSTANA, B., op. cit., p. 145.—Prinsta Bay; Div. 1, A. G.

A. JULIA, B., op. cit., p. 146. The Jumpers; Div. 4, A. G.

A. JUNIA, n. sp.—Shell small, orbiculo-pentagonal, both valves convex, width almost equal to the length. The sides in the rostral third are nearly straight and converge to form an angle at the apex of about 100° degrees; in the middle third rounded; in the lower third somewhat straight and converging to the mesial fold; the ventral margin straight in the median third or for the width of the fold and sinus. Ventral valve rather strongly convex, uniformly arched from beak to front: umbo moderate; beak small, closely incurved over the umbo of the dorsal valve; mesial sinus deep and concave; at the front margin about one-third the whole width, dying out near the umbo; bounded on each side by a strong rounded fold, outside of which an obscure sinus nearly as wide. Dorsal valve less convex than the ventral; umbo moderate; beak buried under that of the ventral valve; a strong mesial fold narrowly rounded along its crest with a deep subangular sinus on each side, all dying out a little above the mid-length. Surface apparently smooth but in some specimens exhibiting

concentric lines under a magnifier. Length and width about 4 lines. Six miles east of Otter River, near Jupiter River and the Jumpers; Divs. 2, 3, 4. J. Richardson.

This species is somewhat similar in form to *A. congesta*, Conrad, which abounds in the Clinton formation in New York, but differs therefrom in having the mesial fold and sinus shorter.

A. TUMIDULA, n. sp.—Sub-orbicular; width slightly greater than the length; apical angle about 105°; sides nearly straight for a little over one-third the length from the umbo, rounded in the middle third and towards the front margin; the latter with a broadly convex lobe. Ventral valve rather strongly convex, nearly uniformly arched from beak to front, the most abrupt curve being above the middle; umbo moderate; beak small, incurved down to the umbo of the opposite valve; front margin produced into a curved rounded linguiform lobe from each side of which a faint, barely perceptible depression runs towards the beak, the space between them with about the average convexity of the valve. Dorsal valve less convex than the ventral, sub-carinate along the middle, sloping to the sides; mesial fold at the front nearly one-third the whole width, strongly elevated, rounded along the crest, becoming obscure or so little developed above the mid-length as to produce only an obtuse median carination; on each side of the fold a faint rounded sinus outside of which the shell has a somewhat flat slope to the sides; umbo moderate, beak curved beneath that of the opposite valve. The hinge line of this valve is nearly straight for more than half the whole width. When the shell is a little exfoliated there can be seen on each side of the umbo two dark lines radiating from the beak indicating a pair of short septa. Surface smooth. Length of large specimen 9 lines; width 10 lines. Near Jupiter River and four miles west of South-west Point; Div. 3, A. G. J. Richardson.

This species resembles *A. tumida*, Dalman, but is smaller, more angular along the middle, the hinge line of the dorsal valve straighter, and has two short septa radiating from the beak instead of one.

A. LARA, n. sp.—Shell lenticular, sub-pentagonal or sub-ovate, greatest width a little above the middle where it is equal to or a little more or less than the length; apical angle usually about 120°; sides straight or gently concave from the beak to the cardinal angles, rounded in the middle third; somewhat straight and converging in the lower half; the front margin straight or gently convex in the middle. Both valves are moderately and about equally convex; umbo and beak of ventral valve small, the latter closely incurved; umbo of dorsal valve distinct but not prominent, beak buried; hinge-line in most specimens straightish. Surface smooth. Length and breadth 6 or 7 lines; depth of both valves 4 lines. Gull Cape; Div. 2, A. G. J. Richardson.

In some specimens there are faint indications of a mesial sinus on the ventral valve, but in general the form is smoothly lenticular without either fold or sinus. In small individuals the apical angle is often much less than that above given, the most acute being 107°.

A. SOLITARIA, n. sp.—Shell transversely ovate, lenticular; front margin with a small space in the middle straight or concave. Ventral valve moderately convex; umbones and beak small, the latter closely incurved; a mesial sulcus, sub-angular in the bottom, commences on the umbo and becomes gradually wider and deeper to the front margin where it is about one-fourth the whole width of the shell. Dorsal valve gently convex with a faint double mesial fold. Surface with obscure concentric striæ. Length 5 lines; width 6 lines. South-west Point; Div. 4, A. G. J. Richardson. Only one specimen collected.

C. MYRTEA, B., op. cit., p. 165.—South-west Point; Div. 4, A. G.

Genus SPIRIFERA, Sowerby.

S. PLICATELLA, Linn.—South-west Point, and the Jumpers; Div. 4, A. G.

Genus LEPTOCŒLIA, Hall.

L. HEMISPHERICA, Sowerby.—South-west Point, the Jumpers, and East Point; Divs. 3, 4.

LAMELLIBRANCHIATA.

Genus MODIOLOPSIS, Hall.

M. STRIATA, n. sp.—Shell moderately convex; anterior extremity short, rounded and somewhat compressed; ventral margin straight or slightly concave for a short space in the anterior half; posterior extremity broadly rounded in the ventral half; apparently sub-angular at the mid-height, obliquely and convexly truncated above. The beaks are small, closely incurved, about one-sixth the whole length from the anterior extremity. The umbones moderate; greatest gibbosity a little behind the mid-length and above the mid-height. The posterior point of the dorsum is imperfect, in all the specimens observed, but judging from the course of the striæ it appears to be gently rounded from the end of the hinge line, downwards. This point is also somewhat compressed. Surface with fine but very distinct concentric striæ from eight to ten in one line. Length 14 lines; greatest width, at about one-fourth the length from the posterior extremity 11 lines; width at the umbones 9 lines. Depth of both valves 6 lines. Another specimen has a length of 15 lines; width 12 lines; depth of both valves 7 lines. This specimen has a more widely ventricose aspect than the former, but seems to be certainly of the same species.

It occurs at Junction Cliff and near Jupiter River; Divs. 1, 2, A. G. J. Richardson.

Genus CYRTODONTA, Billings.

C. ACCUTUMBONA, n. sp.—This species is about the size and shape of *C. ungulata*, with the difference that the umbones are very strongly carinated. The posterior portion of the shell is broken off, and the entire outline cannot, therefore, be made out. One mile south of Junction Cliff, Anticosti; Div. 1, A. G. T. C. Weston.

Genus AMBONYCHIA, Hall.

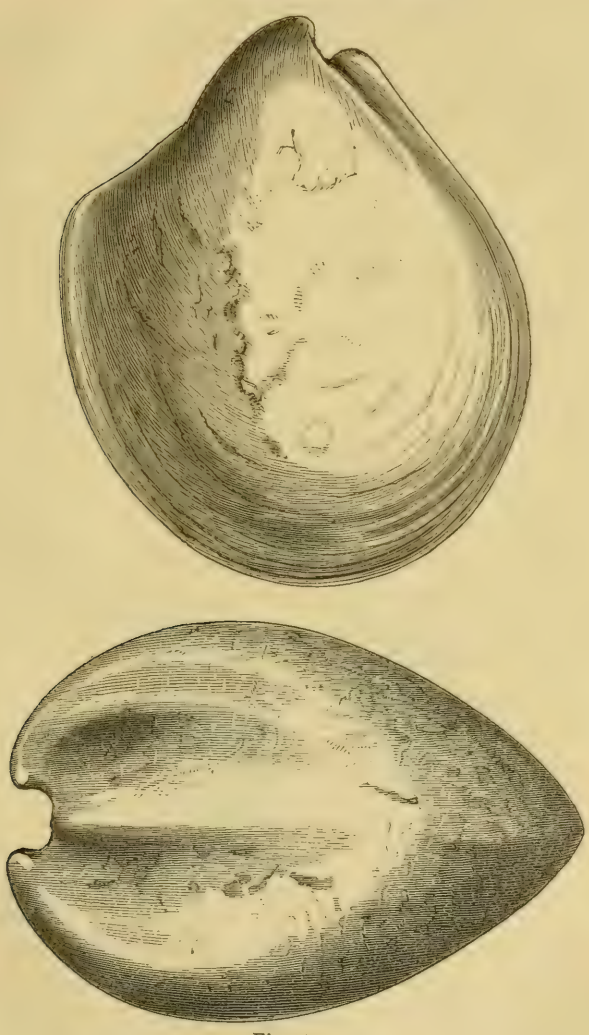

Fig. 16.

Fig. 16.—*Ambonychia superba.* Right valve and anterior view.

A. SUPERBA, n. sp.—Shell large, strongly ventricose, sub-cordiform. Anterior and posterior sides gently convex and sub-parallel. Ventral margin uniformly rounded. Hinge line equal to the whole length of the shell, nearly; posterior wing moderately prominent; angle formed by the hinge line and the posterior side about 100°; anterior wing rudimentary. The beaks, as shown in the cast, are scarcely incurved. There is a well-developed area, between them, which extends the whole length of the hinge line. Height from the middle of the ventral margin to the beaks, 3 inches; length 2½ inches; depth of both valves about 2 inches. Junction Cliff; Div. 1, A. G. T. C. Weston.

A. RADIATA, Hall.—Occurs abundantly at Gamache Bay; Div. 1, A. G. Also in the H. R.

A NITIDA, n. sp.—Shell elongate, ovate, rather strongly convex; beaks small, terminal, closely incurved. On the anterior side the outline for a short distance from the beaks is nearly straight, slightly concave, then gradually rounded to the somewhat pointed ventral extremity. Beneath the beaks there is an obscure lunette with a minute rudiment of an anterior wing. Hinge-line short, straight, forming an angle of about 45° with the longitudinal axis of the shell; a very narrow area. Posterior margin slightly compressed, gradually and somewhat irregularly curved to the ventral angle. The greatest convexity of the shell lies along a straight line from the beak to the ventral angle. Surface with obscure concentric striæ which are impressed on the cast of the interior. Length 15 lines; width 9 lines; depth of both valves 8 lines. One-fourth of a mile east of Jupiter River; Div. 3, A. G.

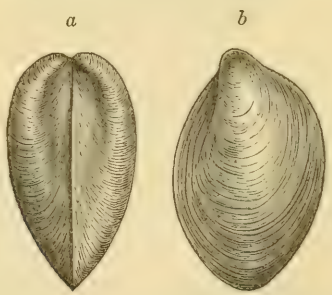

Fig. 17.

Fig. 17.—*Ambonychia nitida*. *a*, anterior view; *b*, right valve.

Genus PTERINEA, Goldfuss.

P. VARISTRIATA, n. sp.—Obliquely semi-elliptical or sub-rhomboidal hinge line long and straight forming an angle of about 45° with the body of the shell; anterior wing short, rounded with a faint sinus at about one-

third the height of the shell from the hinge line ; below the sinus obliquely rounded backwards along the ventral margin to the lower posterior angle which is somewhat narrowly rounded. The posterior wing is large and much compressed ; the angle about 90° ; below which the outline is slightly concave for about one-third the height and then convex to the lower posterior angle. The beaks appear to be rather large, closely incurved and situated about one-fifth of the whole length of the hinge line from the anterior angle. The left valve is obliquely and rather strongly convex, the body of the shell (or the convex portion excluding the wings) narrow. The right valve is moderately convex and in one specimen nearly flat. Surface of left valve with fine radiating striæ, about two in one line, crossed by finer sub-lamellose concentric striæ. There are also some concentries undulations of growth. Surface of right value with strong concentric, concave undulations of growth about one line wide each : and perhaps also radiating striæ, but the specimens do not show any of these latter. Length of the largest specimen seen, on the hinge line, 15 lines ; height 12 lines.

The difference in the surface characters of the two valves is so great that they would not be regarded as belonging to the same species unless in place. One specimen free from the matrix and with the valves in connection was collected. Gamache Bay ; Div. 1, A. G. T. C. Weston.

P. CURIOSA, n. sp.—The specimen on which this species is founded has both valves in connection and is perfectly detached from the matrix but it is not certain that the whole of the margin is preserved so that the following description may not give the true outline of the perfect shell. The left valve is rather strongly convex with a moderately compressed posterior wing. Hinge line straight, six lines in length ; beak of left valve small, pointed, incurved over the area and situated nearly two lines from the anterior extremity of the area ; the latter apparently concave, one line in height at the beak. That part of the shell which lies below a line drawn across two lines below the area is a triangle of which the two lower sides are gently convex and meet to form an obtuse rounded angle of about 110°. This angle is situated a little in front of a line drawn vertically downwards at a right angle from the mid-length of the area of the right valve. Above the line (drawn across the shell) the anterior extremity slopes towards the beak ; the posterior extremity rounded to the hinge-line. Distance from the middle of the area of the right valve to the angle on the ventral margin nearly seven lines ; width of the shell on a line two lines below the area eight lines ; from the beak of the left valve to the ventral angle eight lines.

The right valve is gently convex. The shell appears to be very thin and with fine concentric striæ on the left valve which on approaching the

hinge line behind the beak show a gentle curve convex towards the anterior side. From the direction in which these striæ reach the cardinal edge it would appear that the shell, when, perfect has a distinctly angular, not rounded, posterior wing. Near Jupiter River in the lower part of Div. 3, A. G. J. Richardson.

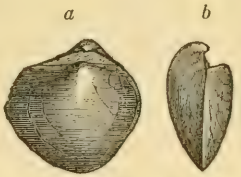

Fig. 18.

Fig. 18.—*Pterinea curiosa.* *a*, view of the right valve showing the area of the right; *b*, anterior view.

P. SUBPLANA, Hall.—A species which is either identical with or closely allied to this occurs at Point Laframboise; Div. 1, A. G.

P. THISBE, n. sp.—Right valve with the hinge line long and straight, equal to the whole length of the shell; posterior margin forming nearly a right angle with the hinge line and nearly straight (slightly concave) for a little more than half the width, then broadly rounded into the ventral margin; anterior extremity short, the outline obliquely rounded into the ventral margin which is broadly and gently convex. The body of the shell is moderately convex with the usual obliquity. The wing compressed. Beak small close to he anterior end. Left valve rather strongly convex. Surface with very obscure radiating ribs, three or four in two lines. Length of right valve on hinge line 9 lines; height from the mid-length of hinge line to ventral margin 7 lines. Only two specimens were collected, one right and one left valve, the latter very imperfect. Challoupe River; Div. 4, A. G. J. Richardson.

The left valve of this species has very nearly the same form as *P. undata*, Hall, as figured by WINCHELL and MARCY in the "Memoirs of the Bost. Nat. Hist. Soc. Vol. 1, pl. 3, f. 2. It is however more oblique anteriorly and not so nearly square.

Genus ISCHYRINIA, Billings (ante p. 16.)

I. WINCHELLI. B.—Junction Cliff; Div. 1, A. G. Also in H. R.

I. PLICATA, n. sp.—Cast of the interior transversely ovate, moderately convex; anterior extremity in the upper fourth straight, and forming a slightly obtuse angle with the hinge line, below rounded; ventral margin broadly and uniformly convex, gradually rounded from the mid-length up to the posterior extremity which is acute and has its most projecting point about one-fourth the height below the hinge line; above this point ob-

liquely truncated ? umbones and beak as indicated by the cast moderate, situated at one-third the length from the anterior extremity. Behind the umbones there are two conspicuous concave plications, one of which has its upper side close to the hinge-line and extends from near the umbones backwards to the posterior angle ; the other is below and separated from the former only by an angular ridge. Just in front of the umbones there is a deep narrow fissure extending downwards one-fourth the height of the shell ; in front of the umbones a smaller fissure on each side of the hinge-line. Length 8 lines ; height at the mid-length 5 lines ; depth of both valves 3 lines. Junction Cliff ; Div. 1, A. G. J. Richardson.

This species has the form of a Cleidophorus, but the occurrence of two pairs of fissures induces me to dispose of it as above.

Genus Conocardium, Bronn.

C. elegantulum, n. sp.—Shell small, short, strongly carinated from the beaks to the ventral angle. Posterior extremity depressed sub-conical to the base of the siphonal tube ; the slope of the surface gently concave ; acutely carinated from the tube to the angle below, the carina being formed by the junction of the edges of the valves. This part is ornamented with ten or twelve fine striæ running from the beaks downwards to the margin. From the beaks a strong rounded ridge runs to the ventral angle and separates the posterior from the anterior extremity. This ridge is sub-angular along its crest and has its posterior edge formed by a sharp raised line. It is minutely striated transversely. The anterior extremity is a depressed oblique cone with its apex formed by the extremity of the hinge-line ; minutely striated, the striæ running up the cone. Placing the shell with the hinge-line downwards the contour on a side view is that of an acute angled triangle, the apex, slightly truncated, being the ventral angle. On an end view the outline is perfectly cordiform. Length from the umbones to the ventral angle a little more than 3 lines ; length of the hinge-line apparently about 2½ lines ; depth of both valves 3 lines.

This little shell by its strongly carinated sides is allied to *C. ornatum* Winchell and Marcy, Op. cit., p. 111, pl. II, fig. 15. The carinated portion is, however, much narrower and more minutely striated. The striæ can only be seen with a glass magnifying 30 diameters. The markings on the extremities are just visible to the naked eye.

South-west Point ; Div. 4, A. G. J. Richardson.

GASTEROPODA.

Genus Subulites, Conrad.

S. Elongata, Conrad.—Occurs at Gamache Bay ; Div. 1, A. G. Also in H. R.

S. NOTATUS, n. sp.—Shell small consisting of four depressed convex whorls of which the last equals the apical three in length. The outline is strongly curved on the posterior side (or side opposite the aperture). Apical angle about 45°. The shell is mostly all removed from the specimen, but on the cast there is a concave band on all the whorls just above and close to the suture. This is so distinctly marked as to induce the belief that it is not an individual peculiarity. Length of the specimen 16 lines; length of body whorl 8 lines; width of the same 7 lines. Junction Cliff; Div. 1, A. G. J. Richardson.

Genus PLEUROTOMARIA, Defrance.

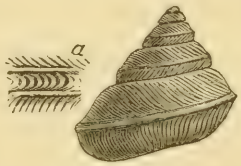

Fig. 19.

Fig. 19.—*Pleurotomaria Sybillina*, Side view; *a*, the band enlarged.

P. SYBILLINA, n. sp.—Shell conical; apical angle about 70°; whorls four or five, moderately convex. The whorls are angular ventricose; on the upper side gently convex with an obscure carina half way between the suture and the margin. On the upper side of the margin there is a narrow band which appears to be convex with an elevated line above and another below it. Below the band the side of the body whorl is nearly vertical for about one-fourth its height then convexly rounded into the umbilicus. Surface covered with fine sharp striæ which curve backwards to the band; about eight striæ in the width of one line. On the underside of the body whorl of one specimen there is a set of distinct revolving striæ crossing the others at right angles and forming a minute square reticulation. Junction Cliff; Div. 1, A. G. T. C. Weston.

Associated with the above there are specimens without the carina on the upper side of the body whorl although it is seen obscurely on the smaller ones.

P. CRYPTATA, n. sp.—Cast of the interior very depressed conical, consisting of three rather slender whorls which have a rounded quadrate section, the upper lower and outer sides of the whorls being depressed convex. The second whorl rises about half its height above the first; the apical whorl minute. The umbilicus is about one-third the whole width. In one specimen the whorls are more ventricose, the section being nearly circular. Width 7 lines; height 3½ lines; diameter of body whorl near the aperture 2¾ lines. Near Challoupe River; Div. 3, A. G., J. Richardson.

Genus MURCHISONIA, De Verneuil et D'Archiac.

M. GRACILIS, Hall.—Gamache Bay, Cape Sand-Top and other localities in Divs. 1, 2, A. G. Also in H. R.

M. GIGANTEA, B., Rep. 1857, p. 298.—Prinsta Bay; Div. 1, A. G.

M. TERETIFORMIS, B., op. cit., p. 298.—Gamache Bay, Div. 1, A. G. Also in H. R. This species has a wide flat band about the middle of the whorl and appears to be a large variety of *M. bellicincta*, Hall.

M. VENTRICOSA, Hall.—Gamache Bay; Div. 1, A. G. Also in H. R.

M. TURRICULA, B., op. cit., p. 301.—The Jumpers; Div. 4, A. G.

M. PAPILLOSA, B., op. cit., p. 301.—Gamache Bay; Div. 1. A. G.

M. FUNATA., n. sp.—The casts of the interior have about eight uniformly ventricose whorls. Length 21 lines; width of body whorl 8 lines. This species is larger than *M. gracilis* and smaller and more gradually tapering than *M. bellicincta*. There are obscure indications on one specimen of revolving striæ. The Jumpers; Div. 4, A. G.

M. RUGOSA, B., op. cit., p. 299.—Gamache Bay; Div. 1, A. G. Also in H. R.

Genus LOXONEMA, Phillips.

L. ACULEATA.—Shell small, very slender consisting of about ten moderately and uniformly ventricose whorls. Length of a specimen of eight whorls 13 lines; width of the body whorl 3½ lines. Near Challoupe River; Div. 3, A. G., J. Richardson.

Genus CYCLONEMA, Hall.

C. THALIA, B., op. cit., p. 303 = *Pleurotomaria Thalia*.—Gamache Bay; Div. 1, A. G. Also in H. R.

C. PERCINGULATA, B., op. cit., p. 304.—South-west Point; Div. 4, A. G.

C. VARIANS, B., op. cit., p. 305.—South-west Point; Div. 4. A. G.

C. COMMUNIS, n. sp.—Cast of the interior depressed turbinate, consisting of three ventricose whorls with a deep suture, the lower outer side of the whorls projecting or more convex than the upper part. Umbilicus about one-fourth of the whole width (sometimes a little less). Apical angle about 110°. Width of the base 15 lines; height of spire about 12 lines; width of last whorl 9 lines. The Jumpers; Div. 4, A. G. J. Richardson.

C. BELLULA, n. sp.—Shell small, conical, consisting of three ventricose whorls which are most prominent in the basal half or two-thirds of their

height, more gently convex towards the suture. Surface with fine striæ which curve backwards from the suture downwards, crossed by fine revolving lines barely invisible on the upper side of the whorl but very distinct near the umbilicus. The latter not visible in the specimens examined, but probably very small. Apical angle 65° ; height 5 lines ; width of body whorl 4 lines ; height of the same 4 lines. Differs from *C. cancellata*, Hall, in being more ventricose in the Lower half of the whorls. The Jumpers ; Div. 4, A. G. J. Richardson.

C. HUMILIS, n sp.—Shell small with a large oblique body whorl, which constitutes nearly the whole bulk ; the apical whorl minute ; whorls ventricose, most convex towards the base. Surface with fine transverse and revolving striæ. Height about five lines ; width of body whorl from the outer lip through to the opposite side six lines. Resembles *C. obsoleta*, Hall, but is distinctly cancellated. The Jumpers ; Div. 4, A. G. J. Richardson.

C. MEDIOCRIS, n. sp.—Shell small, consisting of four rather slender and uniformly ventricose whorls ; the apical three of which are very small, but considerably elevated. Surface of the cast of the interior with oblique obscure undulations ; surface of shell unknown. Height six lines ; width from the outer lip through to the opposite side six lines ; diameter of the aperture, which is nearly circular, three lines. There appears to be a small umbilicus in this species almost half a line wide. It was collected four miles west of South-west Point ; Div. 3, A. G. J. Richardson.

C. DECORA. n. sp.—Shell conical, consisting of about four uniformly ventricose whorls ; umbilicus one-fifth the whole width ; aperture nearly circular. Surface covered with strong revolving striæ, of which there are four or five in the width of one line ; height about 8 lines, width 7½ lines ; diameter of the aperture four lines. This species resembles the last, but differs in having the upper whorls proportionately larger. It seems probable also, that the striæ, on account of their strength, would be visible on the cast of the interior, but none can be made out on the specimen on which *C. mediocris* is founded. South-west Point ; Div. 4, A. G. J. Richardson.

Genus BELLEROPHON, Montfort.

B. BILOBATUS, Sowerby.—Gamache Bay ; Div. 1, A. G. Also in H. R.

B. ACUTUS, Sowerby.—Gamache Bay ; Div. 1, A. G.

B. CANADENSIS, B., ante, p. 18.—Cape Sand-Top Bay ; Div. 1, A. G. Also in H. R.

B. DILATATUS ?, Sowerby.—The Jumpers ; Div. 4, A. G.

Genus PTEROTHECA, Salter.

P. TRANSVERSA, Salter.—Gamache Bay; Div. 1, A. G. Also in H. R.

CEPHALOPODA.

O. CANADENSE, B., Rep. 1857, p. 321.—South-west Point; Div. 4, A. G.

O. PERSIPHONATUM, B., op. cit., p. 329.—Cormorant Point; Div. 3, A. G.

O. BUCKLANDII, B., op. cit., p. 320.—South-west Point; Div. 4, A. G.

O. RAPTOR, n. sp.—Section circular; septa moderately convex, six to one inch where the diameter is fifteen lines; siphuncle central or nearly so, moniliform, the segments three lines in diameter where the width of the shell is eighteen lines. Outer chamber and surface unknown. The specimens are not perfect, but seem to taper at a rate of about three lines in two inches. The segments of the siphuncle are uniformly rounded at the sides and flat at each end, the whole resembling a line of spheres simply flattened a little by being pressed against each other longitudinally. One specimen was collected one mile east of Otter River, and another three miles west of Jupiter River; Div. 2, A. G. J. Richardson.

O. MEDON, n. sp.—Septa rather strongly convex, six lines distant from each other where the diamater of the shell is thirty lines; siphuncle large, apparently a little excentric, inflated between the septa, the segments being in the form of spheres compressed at both ends. The specimen is six inches in length, thirty lines in diameter at the larger, and twenty-one lines at the smaller extremity. It is worn away on the opposite sides, so that it cannot be ascertained whether the section is circular or otherwise. The siphuncle is exposed on one side the whole length. Its diameter is twelve lines throughout. The segments are uniformly rounded on their sides, not more inflated on the apical side than they are on the anterior side, but simply a line of spheres compressed longitudinally as in *O. raptor*. South-west Point; Div. 4, A. G. J. Richardson.

O. INFELIX, n. sp.—This species is founded on portions of two siphuncles. The first is twenty-seven lines in length; twelve lines in diameter at the larger and eight lines at the smaller extremity; and consists of ten nummuloid segments with uniformly rounded edges. The second specimen is eighteen lines in length, eleven lines in diameter at the larger and eight lines at the smaller extremity, with seven segments of the same form as those of the first. The rate of tapering is not uniform, both specimens being nearly cylindrical and narrowed only in the four segments at the smaller end. South-west Point, Div. 4, A G. J. Richardson.

O. BELLATULUM, n. sp.—Shell apparently below the medium size, very gradually tapering ; section circular or very nearly so ; septa about eight to the inch, where the diameter is eleven lines ; surface longitudinally sulcated with narrow concave grooves and covered with minute transverse and longitudinal striæ which are equally distinct both in the grooves, and on the ridges between them, about twenty striæ in one line. The casts of the interior of the chamber of habitation exhibit a broad shallow concave constriction close to the aperture. Siphuncle unknown.

The best preserved specimen consists of the chamber of habitation and the last four septa. Length 30 lines ; diameter at the aperture 12 lines ; at the fourth septum, where broken off 11 lines ; width of the constriction near the aperture 7 lines ; depth of the same $\frac{1}{4}$ of a line. There are about 50 longitudinal sulci of nearly equal width, the average being five sulci in three lines or thereabout. The four septa occupy $6\frac{1}{2}$ lines in the length of the fossil ; the chamber of habitation 24 lines. The section is not quite circular, but broad ovate apparently owing to pressure.

The second specimen is 41 lines in length with nine septa and the chamber of habitation, which latter is 21 lines in length ; width of the constriction 6 lines ; depth $\frac{1}{4}$ of a line ; space occupied by the nine septa 16 lines. As the specimen is distorted by pressure the diameter cannot be made out exactly, but it appears to be about $12\frac{1}{2}$ lines at the aperture, and 10 lines at the ninth septum, thus tapering at the rate of one line to the inch. There are 34 sulci, but as the shell is not preserved the surface markings cannot be determined. This specimen differs from the former in having wider sulci and consequently fewer of them, but in other respects appears to be specifically identical.

It is possible that this may be *O. virigatum*, Sowerby, now referred to *O. angulatum*, Wahlenberg, by European authors. According to McCoy the English specimens taper at the rate of $2\frac{1}{2}$ lines to the inch. Should it turn out that the two specimens above described belong to distinct species I desire that the first, as it shows the surface marking, may be accepted as the type.

Three miles east of Challoupe River ; Div. 3, A. G. J. Richardson.

O. FORMOSUM, B., op. cit. p. 317. Junction Cliff ; Div. 1, A. G. Also in H. R.

O. SEDGWICKI, B., op. cit., p. 320. Junction Cliff ; Div. 1, A. G. Also in H. R.

O. SIEBOLDI, B., Gamache Bay ; Div. 1, A. G. Also in H. R.

O. PILEOLUM, n. sp.—Shell small, short, conical, expanding to a diameter of twelve lines in a length of eighteen ; surface apparently smooth, but on close examination covered with fine obscure engirdling striæ. The

specimen is a little flattened by pressure, and it cannot, therefore, be determined whether the section is circular or slightly ovate. Three of the septa are visible near the apex, distant from each other about one line. Siphuncle unknown. Length of the specimen 18 lines ; diameter at the aperture 12 lines. Near Jupiter River ; Div. 2, A. G. J. Richardson.

Genus Cyrtoceras, Goldfuss.

C. fragile, n. sp.—Shell of the ordinary size, rather strongly arched, most ventriose about the mid-length, thence gradually tapering in both directions ; siphuncle small ; close to the shell on the ventral or convex curve ; septa about eight to the inch measured on the median line of the ventral aspect ; section ovate, the dorso-ventral diameter bearing the proportion of 9 to 7 to that of the lateral diameter. Surface unknown.

The best preserved specimen has the following dimensions very nearly : diameters at the aperture 7 to 5½ lines ; at the last septum 9 to 7 lines ; at the tenth septum 4 to 3 lines ; depth of chamber of habitation 7 lines ; length on the ventral aspect occupied by the last five septa 7 lines. From the aperture to the tenth septum the ventral aspect is curved to a radius of about 12 lines ; thence towards the apex more gradually.

Judging from a number of broken and distorted specimens, some of the individuals attained a length of four or five inches. Gamache Bay ; Div. 1, A. G. T. C. Weston.

Genus Oncoceras, Hall.

O. futile, n. sp.—Shell fusiform, gradually expanding from the aperture to the last chamber, and then tapering towards the apex. Eight septa in the length of one inch. Siphuncle unknown. Width of the best preserved specimen at the aperture 9 lines ; width at the last septum 14 lines ; at the eighth septum 9½ lines ; depth of chamber of habitation 11 lines. East of Jupiter River ; Div. 3, A. G. J. Richardson.

O. amator, n. sp.—Length of the specimen 12 lines ; lateral diameter at the aperture 8 lines ; dorso-ventral diameter about 7 lines ; diameter at the smaller extremity 3½ lines. Surface cancellated with longitudinal and transverse striæ. Of the former there is a set sufficiently strong to give an obscurely fluted aspect ; the space between each two of these is divided by a smaller line along the middle ; on each side are others still smaller and more obscure. The transverse markings are, also, of several sizes. Siphuncle and septa unknown. South-west Point ; Div. 4, A. G. J. Richardson.

Genus Ascoceras, Barrande.

A. Newberryi, B., Pal. Foss. vol. i, p. 164, fig. 148*a*, non. 148*b*.—Junction Cliff; Div. 1, A. G. Also in H. R.

A. ANTICOSTIENSE, n. sp. = *A. Newberryi*, pars, loc. cit., fig. 148*b*. Junction Cliff; Div. 1, A. G.

Genus GLOSSOCERAS, Barrande.

G. DESIDERATUM, n. sp.—This species is founded upon a fragment consisting of two of the lateral chambers and the impression of about two inches in length of the body of the shell. The form appears to be elongate sub-cylindrical, section, about the middle, broad ovate, the dorso-ventral diameter greater than the lateral; the latter, in this individual, fourteen lines. The inner side of the chambers is gently concave, the lower edge broadly rounded, the upper edge concave. The outer side is convex conforming to the form of the shell. Length of the upper of the two chambers on the inner side nine lines in length and twelve lines in width; the lower ten lines in length and eleven in width. The specimen is so imperfect that it should not perhaps be named, but as there is a prospect of further collections from its locality it is probable that materials will soon be forthcoming to complete the description. South-west Point; Div. 4, A. G. J. Richardson.

CRUSTACEA.

Genus ASAPHUS, Brongniart.

A. MEGISTOS, Locke.—Gamache Bay; Div. 1, A. G. Also in H. R.

A. NOTANS, B., ante, p. 25. —Gamache Bay; Div. 1, A. G. Also in H. R.

Genus ILLÆNUS, Dalman.

I. ORBICAUDATUS, B., Can. Nat. Geol., vol. iv, p. 379—Gamache Bay, near Jupiter River and South-west Point; Divs. 1, 2, 3, 4, A. G. Also in H. R.

I. GRANDIS, B. op. cit., p. 380.—Gamache Bay; Div. 1, and South-west Point, Div. 4, A. G. Most probably it occurs throughout the series. It abounds in the H. R.

Genus CALYMENE, Brongniart.

C. BLUMENBACHII, Brongniart.—Occurs at Gamache Bay, Jupiter River, and numerous localities throughout the series.

Genus CHEIRURUS, Beyrich.

C. INSIGENS, Beyrich.—South-west Point; Div. 4, A. G.

C. NUPERUS, n. sp.—Glabella oblong, rounded in front, sides straight, and apparently parallel; three glabellar furrows on each side extending inwards about one-third the width; surface minutely granulose-tubercular; length 4 lines; width near the front 3 lines.

Pygidium with two large and long flat spines directed backwards, between which are four very short ones. It seems to consist of three segments, the first or anterior of which has its pleuræ extended backwards to form the long outer pair of spines, while the other two terminate in the four short ones. East Point; Div. 3, A. G. J. Richardson.

Fig. 20.

Fig. 20.—*Cheirurus nuperus.* Glabella and pygidium. The specimens from which these two figures were taken are on the same piece of stone within six inches of each other and there seems, thus, to be little doubt that they belong to the same individual.

C. PLEUREXANTHEMUS, Green.—Junction Cliff; Div. 1, A. G. Also in H. R.

Genus PHACOPS, Emmrich.

P. ORESTES, B., op. cit., vol. IV, p. 65.—East Point; Div. 3, A. G. Occurs also on the Chatte River in Gaspe in the same horizon.

Genus DALMANTES, Emmrich.

D. MACROURA ?, Angelin.—Junction Cliff; Div. 1, A. G. The eye is rather smaller and closer to the glabella and the pygidium shorter and more rounded at the apex. It is evident however that this is a variable species. The English form is intermediate between the Swedish and Canadian. Salter, in the "Memoirs of the Geo. Surv. G. B." proposed to name the former *D. affinis*, but now thinks it identical with *D. macroura*.* It may be that all these will yet be classified as three distinct but closely allied species. In that case ours might be called *D. Anticostiensis*. The arrangement would then be *D. macroura*, Angelin, (Swedish); *D. affinis*, Salter (English); *D. Anticostiensis*, Billings (Canadian). In the eye of the latter the vertical rows of lenses are the most conspicuous, the oblique series not being perceptible without close examination. In the Swedish specimen figured by Angelin, the oblique arrangement is the most distinct and the vertical obscure.

Genus ENCRINURUS, Emmrich.

E. MULTISEGMENTATUS, Portlock.—Junction Cliff; Div. 1, A. G.

E. PUNCTATUS, Wahlenberg.—East Point and the Jumpers; Div. 3, 4, A. G. Specimens both with and without the caudal mucro occur together at that locality.

* SALTER.—"British Trilobites," Pal. Soc., 1864, p. 37.

E. ELEGANTULUS, n. sp.—Glabella clavate, uniformly and moderately convex; front broadly rounded; sides nearly straight or gently concave, separated from the cheeks by a deep but narrow groove; three very short but deep glabellar furrows on each side; neck furrow all across; surface covered with small rounded tubercles about one-sixth of a line in diameter and a little less than their width distant from each other. All other parts of the head unknown. The glabellar lobes have the appearance of three round tubercles on each side. The first pair of furrows are situated on a line drawn across the glabella at one-third the length from the front margin, and are rather obscure. The two others are about equidistant from each other. The last pair of lobes have their posterior edges nearly in contact with the neck furrow. Pygidium triangular, strongly convex in front; axis elongate acutely conical, depressed convex; twenty four segments, of which the first eight or nine extend all across the others, represented by elongated pits on each side. In the sides there are five pairs of pleuræ. The first pair take their origin at the first segment of the axis, and extending outwards at right angles, nearly, for a distance equal to half the width of the axis curve downwards and backwards until their extremities are about opposite the mid-length of the pygidium. The second pair seem to spring from the second segment of the axis and curve backwards from the side of the axis itself. The third pair originate from the fourth segment of the axis; the fourth pair from the sixth, and the fifth pair from the eight or ninth. The latter are nearly parallel with the sides of the axis, being only slightly curved outwards; towards the apex of the axis they converge and nearly unite behind it, and are continued as two short sharp spines giving the aspect of a double caudal mucro. The fourth pair terminate about opposite the end of the axis, but are not spinose at their extremities. The others almost their own width in advance of each other. There are no tubercles on either the axis or side lobes. Between the fifth rib and the side of the axis there is a narrow smooth space with a faint groove on the inside; it extends round the apex of the axis and seems to be the rudiment of a sixth pair of ribs. Close to the very point of the axis there is a small pit in the smooth border.

Length of glabella, excluding the neck furrow and segment, 3 lines; width at the anterior corners 3¼; width at the neck furrow 2 lines. Length of pygidium, measured along the median line of the axis, but excluding the spines, 5 lines; width measured across at the termination of the first pair of ribs 4 lines; height at the first segment of the axis 2 lines.

Only two specimens, one of the pygidium and the other a glabella, both on the same piece of stone within an inch of each other and almost certainly belonging to the same undividual, were collected. The species is evidently allied to those figured by McCoy under the names of *Zethus atractopyge*

and *Z. rugosus*, but differs sufficiently from both to warrant a name. The Jumpers; Div. 4, A. G. J. Richardson.

The above description, it will be understood, as it is founded on a single individual, may require alteration when further material shall have been procured.

Genus SPHAEROCORYPHE, Angelin.

S. SALTERI, n. sp.—Glabella sub-globular, so much inflated that its convex sides overhang the base all round; neck furrow rather large with a tubercle in it on each side, within and close to the dorsal furrow; neck segment with its margin abruptly elevated, the surface sloping forwards into the furrow; a deep concave groove runs outwards close to the posterior margin to the angles of the head, which appears to be produced into short spines. The width of the neck segment is about one-fourth less than the greatest width of the glabella. The dorsal furrows are deep and concave. The front part of the glabella is, in all the specimens that have been examined imbedded in the matrix, and it cannot therefore be determined whether or not it overhangs the margin. From the small tubercle in the neck furrow on each side, a low rounded ridge runs outwards across the neck furrow.

Length of the head 2½ lines; length of the glabella two lines; width of the neck furrow half a line. These are the dimensions of the largest specimen. Another very small specimen gives the following. Length of the head 1¼ lines; length of glabella one line; length of the posterior margin of the head from the dorsal furrow to the outer angle one line; length of the spine half a line. The width of the head is therefore about twice its length.

This species is undoubtedly congeneric with *Staurocephalus unicus*, Thompson, as figured by Salter*. It differs in having the glabella more uniformly globular, and in the characters of the neck. In *S. unicus*, close under the base of the glabella behind, there is a rounded groove across the neck; then a rounded ridge with a tubercle at each end on the sides of the neck; behind this is the true neck furrow. In this species the tubercles are not connected by a ridge, but on their outsides a ridge runs to the cheeks.

It is more closely allied to *S. granulata*, Angelin, differing therefrom only, so far as can be made out from the figures, in being much more finely tubercled on the surface, and in the neck furrows more deeply excavated.

Only three specimens were found, two of which are above noticed, but the third shows nothing but the upper part of the convex glabella. The

* SALTER, "British Trilolites," pl. VII, figs. 22, 24.

surface of all is covered with small closely crowded tubercles just visible to the naked eye.

Junction Cliff; Div. 1, A. G. J. Richardson, T. C. Weston.

Genus Harpes, Goldfuss.

H. consuetus, n. sp.—This species is of the ordinary form of the genus. Contour of the head including the border and spine ovate, broadly and uniformly rounded in front, gently convex along the sides, and narrowing slightly backwards from a line downwards at the neck furrows to the extremities of the spines. The border is gently concave, with an abruptly elevated wire-like marginal rim all round. All that part which lies in front of the neck segment is not quite a perfect semicircle. The body of the head is moderately convex; glabella rather small, regularly conical; dorsal furrows deep along the sides, rather shallow round the front; neck furrow all across; an obscurely developed pair of lobes at the neck furrow; the depression on each side in front of the neck furrow small. The eyes are small and situated on a line drawn across the glabella at a little less than one-third its length from the apex, and at about one-third the width of the glabella from the dorsal furrow. Surface unknown.

Length from the front margin to a line drawn across the tips of the spine, twelve lines; length of the head six lines; width at the neck segment, ten lines; length of the glabella, three lines; width of the same at the base, two lines; width of the border of the head, two lines.

The specimen consists of a mould of the head from which good gutta percha casts have been obtained, giving the whole form very nearly. This species is closely allied to *H. Ottawaensis*, but is narrower, the head not so convex, and the depressed space on each side of the base of the glabella smaller. South-west point; Div. 4, A. G. J. Richardson.

Genus Sphærexochus, Beyrich.

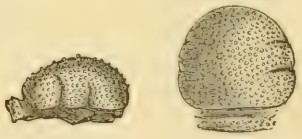

Fig. 21.

Fig. 21.—*Sphærexochus Canadensis.*

S. Canadensis, n. sp.—Glabella convex, abruptly elevated in front, depressed convex in the central region. In a view looking down vertically on the upper side the contour is broad ovate, the anterior half uniformly rounded, the posterior margin somewhat straight in the middle, the posterior corners rounded; greatest width at the posterior third; length a little

less than the width. The posterior glabellar furrows have their inner extremities about one-third of the whole width in from the outer margin and scarcely one-third the length from the posterior margin. They curve slightly forward and outward, and are distinctly impressed down the sides of the glabella to the dorsal furrows. There is a second pair of furrows situated less than one-third the length in front of the posterior pair; they are shorter and not so distinct. Neck furrow narrow and rather deeply sunk; neck segment also narrow and well defined. Surface covered with small rounded or obtusely pointed tubercles from one-fifth to one-fourth of a line in diameter at the base, and usually their own diameter apart from each other although they are sometimes more closely arranged. In certain conditions of preservation these tubercles appear to have an aperture in the top, but this is due to the wearing away of the crust exposing a central dot of the darker-coloured matrix with which the tubercles are filled. The sides of the glabella are so much inflated that they slightly overhang the dorsal furrows.

Length of the glabella 6½ lines; width 7½ lines; width of neck furrow ⅔ of a line; width of neck segment, 1 line.

This species is allied to such forms as Angelini's *S. Wegalini*, *S. conformis*, *and S. granulatus*, but is distinct from them all. South-west Point; Div. 4, A. G. . Richardson.

Genus Lichas, Dalman.

Fig. 22.

Fig. 22.—*Lichas Canadensis.* ThePygidium.

L. Canadensis, n. sp.—Pygidium nearly flat with three pairs of broad foliate ribs, the extremities of which form six projecting subtriangular denticulations around the margin. The axis is short, conical, scarcely one-third the whole length of the pygidium, nearly as broad as it is long, the apex broadly rounded and prominent, at the base gradually sloping into the general surface, well-defined at the sides by the dorsal furrows which do not run round the apex but are continued as a distinct groove

gently curving inwards behind the axis and then slightly outwards, and terminating near the extremities of the inner pair of ribs; three narrow-rounded rings cross the anterior half of the axis. The anterior margin is straight for a length of one-half the whole width, the outer angles broadly rounded backwards to the tips of the first pair of ribs which are situated on a line drawn across at half the length. The form of the first pair of ribs is acutely sub-ovate, gently convex in the middle half of the lower side, broadly convex on the outer side; a deep groove along the middle. A straight line drawn from the junction of one of these ribs to the outer extremity, forms with the median line of the pygidium an angle of about 50°. The second pair are grooved along the middle, the grooves forming with the median line an angle of about 30°, the half of the rib in front of the groove sub-triangular, the posterior half with its anterior side (at the groove) nearly straight, gently convex, the posterior side a nearly uniform depressed arch. The last pair of ribs are nearly parallel with the median line, irregularly triangular, and with a median groove which does not extend quite to the tips. From the axis a low convex ridge runs back to the notch between the last pair of ribs.

As the specimen is partly imbedded in the matrix the margin cannot be entirely made out, but there are certainly two deep triangular notches on each side and apparently a central notch as deep as the others but not so wide in the median line. The whole surface is covered with minute rounded tubercles just visible to the naked eye; a few larger ones scattered here and there, some of them one-fourth of a line wide. Length 14 lines; greatest width, at the tips of the first pair of ribs 21 lines; length and width of the axis 4½ lines.

Associated with this specimen was found part of a head with a glabella very convex in front and with similar surface characters. Only the anterior part is preserved. There is a projecting flattish margin one line wide round the front. East Point; Div. 3, A. G. J. Richardson.

Genus Bronteus, Goldfuss.

B. insularis, n. sp.—Pygidium gently convex, semi-oval; width greater than the length in the proportion of 5 to 4; axis obtusely conical or sub-triangular about one-third the length, its apex moderately well defined; a single groove across at the anterior margin where the width is nearly twice the length. There are sixteen radiating ribs, the anterior pair rather obsure. The outline of the pygidium is uniformly curved all round and just within the margin there is a slight concavity. The ribs become obscure on reaching the edge. All of the axis behind the groove and the anterior margin is smooth. Length 4 lines; width 5 lines. South-west Point; Div. 4, A. G. J. Richardson.

Genus Dionide, Barrande.

D ? perplexa, n. sp.—Head short, crescentiform, broadly and uniformly rounded in front and backwards to the tips of the spines ; posterior margin deeply and uniformly concave. The posterior angles of the head are produced backwards and gradually taper to a point, the whole having the form of a perfect crescent. The dorsal furrows are distant from each other a little more than one-fourth the width of the head on a line drawn across at the neck segment. They converge inwardly so that at the neck furrow they are one-third nearer than they are at the margin. Neck segment rather large, strongly elevated at the margin and sloping down into the neck furrow which is angular in the bottom and has a deep pit at each extremity in the dorsal furrow. From each of these pits a slightly impressed line runs forwards and may be a continuation of the dorsal furrow. In front of the pits there is a pair of tubercles resembling glabella lobes. In front of these another pair of deep pits. The front of the head is crushed in the only specimen collected. Just outside of the tubercles above mentioned there is an elevated tubercle on each side, probably the bases of the eyes. Length of the head from the neck segment to the front margin about 3 lines ; length from the front margin to a line drawn across the tips of the spines, 5 lines ; width between the tips of the spines 8 lines ; width at the neck segment 7½ lines ; distance between the dorsal furrows at the posterior margin 2 lines ; distance between the supposed eyes 3 lines ; from the centres of the supposed eyes to the posterior margin 1¼ lines. The Jumpers ; Div. 4, A. G. J. Richardson.

The surface seems to be smooth with the exception of a few tubercles on the spines.

This trilobite may belong to some other genus, but as it resembles (except the eyes) *Dionide*, I shall place it in that group provisionally until better specimens can be procured.

Genus Beyrichia, McCoy.

In the following description the widest extremity of the fossil is regarded as being posterior.

B. decora, n. sp.—Carapace valves small, semi-ovate ; anterior margin for about half its length nearly straight and usually forming a right angle with the hinge line ; then rounded off to the ventral margin which is straightish or gently convex in the middle half ; posterior margin forming an obtuse angle with the hinge line and straight in the upper third, then rounded off to the ventral margin. Right valve with a very convex ovate tubercle in the lower posterior angle extending from the ventral margin slightly more than half way to the hinge line ; the space between it and

the hinge line nearly flat with a sharp sulcus close to the margin. The posterior and lower sides of this tubercle rise abruptly from the edge of the valve. There is no sulcus along the margin in this part as there is in *B. Klœdeni*. The median tubercle is a strongly elevated angular ridge running from a point situated on the hinge line a little over one-fourth the length from the posterior angle, downwards nearly to the ventral margin. The anterior tubercle originates at a point situated on the hinge line a little more than one-third the length from the anterior angle. It has a wider base than the median tubercle, but is quite as angular along its crest. It is abruptly elevated at the hinge line, but declines in height towards the ventral margin just before reaching which it bends round and running along the margin unites with the posterior tubercle. In front of it there is a deep round sulcus with a sharp elevated ridge outside of it on the very edge of the valve. This sulcus commences at the hinge line, and runs along the anterior margin and nearly half the length of the ventral margin when it terminates abruptly.

The left valve is like the right, but in the only good specimen observed the posterior tubercle is more prominent. Length of the largest valve seen $1\frac{1}{2}$ lines ; width near the posterior extremity 1 line. East Point, The Jumpers and other localities in Divs. 3, 4, A. G. J. Richardson.

B. VENUSTA, n. sp.—Carapace valves semi-ovate ; width a little more than half the length ; posterior margin rounded, forming an obtuse angle with the hinge line ; ventral margin moderately convex ; anterior extremity somewhat narrower than the posterior, in the upper half straightish and nearly at right angles to the hinge line, below rounded into the ventral margin. There is an abruptly elevated rim all round except on the hinge line and just within it a deep concave marginal sulcus which is partially interrupted about the mid-length by a low vertical ridge which is scarcely visible in some specimens. There are two large ridge like tubercles originating at the hinge-line and extending two-thirds the width across when they converge and unite. They are separated by a deep conical sulcus. There is a third obscurely developed ridge just behind the posterior tubercles with which it unites below. The two principal tubercles divide the hinge line into three nearly equal parts. When magnified thirty diameters the surface is seen to be covered with minute rounded pits in some specimens closely crowded together and in others separated, sometimes half their own width. Length 1 line ; width about $\frac{2}{3}$ of a line. East Point, Chaloupe River, the Jumpers and other places; Divs. 3, 4, A. G. J. Richardson.

Genus LEPERDITIA, Roualt,

L. ANTICOSTIANA, Jones. The original specimen was from East Point, but it occurs also at the Jumpers and other places in Divs. 3, 4, A. G.

INCERTÆ SEDIS.

In 1854 I collected in the Trenton Limestone at Ottawa, a number of obscurely preserved sub-globular fossils, which appeared to have been covered with an integument of small polygonal plates like the Cystideans of the genus *Sphæronites*. As there were no columns attached to or associated with them, and as it could not be determined that they possessed the apertures of the Cystideans, I hesitated to place them in that group. In 1856 Mr. Richardson discovered another species of the same genus in the Middle Silurian rocks of Anticosti. In my report for 1856 I described both of these species without referring them to any precise zoological station. The following is the original description:—

"CLASS UNCERTAIN."

"*Genus* PASCEOLUS."

"The above generic name is proposed for certain ovate or sub-globular bodies resembling the *Ischadites Kœnigi* of the Silurian system, but differing therefrom in the form of the plate-like markings of the casts of the interior, which in this genus are pentagonal or hexagonal instead of quadrangular. A specimen from Anticosti shews that the animal was inclosed in a thin leather-like sack, and attached to the bottom by a short tubular continuation of this external covering. Its affinities appear to be with those of the *Tunicata*."

"PASCEOLUS HALLI."

"*Description.*—Body ovate or balloon shaped, being regularly rounded above and produced below into a short neck-like pedicle, which constitutes the organ of attachment; outer integument thin, its external surface covered with small irregular rounded wrinkles about ten in one line, distinctly visible to the naked eye; its interior reticulated with ridges corresponding to the divisions between the plate-like markings of the cast of the inside. The cast of the interior is completely covered with hexagonal or pentagonal divisions, presenting the appearances of *Sphæronites* or *Favosites*; these spaces are each about a quarter of a line in diameter at the base of the fossil, but increase in size above, until at the summit they are one line in diameter. The spaces are convex in their centres, and the interior of the integument is fitted with concave depressions to correspond.

One specimen was procured with the integument preserved; it extends below the base, and encloses the short pedicle as well as the body above. On one side of the cast there is a small elevation about half-way between the top and bottom, which appears to mark the position of an aperture in the side of the animal. I beg to dedicate this species to Professor Hall. Length of specimens one inch and a-half, greatest diameter about the middle, thirteen lines.

Locality and Formation.—White Cliff, Gamache Bay, Middle Silurian

Collector.—J. Richardson."

"PASCEOLUS GLOBOSUS."

"*Description*.—Sub-globular from one to two inches in diameter; surface markings principally hexagonal, and about two lines in diameter.

Locality and Formation.—Trenton limestone, City of Ottawa, where it is found in certain quarries in great numbers, usually flattened or pressed into a hemispherical shape.

Collector.—E. Billings."

In the Palæozoic Fossils, vol. i, p. 390, I have, in reconsidering the characters of the genus, stated that these fossils have "one or more circular apertures," but pointed out that in neither of the two species could they be clearly detected. Shortly after the publication of that work, I was informed that Messrs. Verrill and Niles had read a paper on the subject before the Boston Natural History Society. This paper had escaped my attention, otherwise I should have alluded to the fact that they first noticed the affinity between *Pasceolus* and *Cyclocrinus*. The following are their remarks:—

"Mr. A. E. Verrill exhibited specimens of *Pasceolus Halli* Billings, * which occur in the same formation with *Beatricea* at Ellis Bay, Anticosti.

"This fossil was described by Mr. Billings as an *Ascidian*, but some of the specimens collected by the late expedition from Cambridge showed that the exterior was formed by a shell of considerable thickness, composed of small hexagonal and pentagonal plates or prisms, having the outer surface marked with raised radiating lines. Moreover some of the specimens had the lateral openings well preserved, and surrounded by six plates differing in form from the rest. Mr. Verrill had, therefore, considered it as a *Cystidean*. It also agrees with other species of this group in form and appearance.

"Mr. W. H. Niles, having recently made a more complete study of this fossil, was invited by Mr. Verrill to express his opinion upon its relation to the other *Cystideans*.

"Mr. Niles remarked that he had so far studied the specimens exhibited as to be convinced that Mr. Verrill was correct in his belief that they were true Cystideans. The species had been described by Billings under the name of *Pasceolus Halli*, but the genus had been previously described by Eichwald under the name of *Cyclocrinites*. The genus belongs to the family *Sphæronitidæ*.

"Mr. Billings had not been alone in his belief that this family had Ascidian affinities.† M. Kœnig considered the Cystidians as Ascidian Mollusca, and so far as regards this family, was supported by McCoy. The features mentioned by Mr. Verrill entirely preclude the idea of these fossils being the casts of the interior of Ascidians. The same kind of covering

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* Canadian Geological Survey. Report for 1853—'56, p. 342,

† Mr. Niles is quite mistaken in supposing that I ever believed in the "Ascidian affinities" of the *Sphæronitidæ*. I was the first to point out the occurrence of that family in the palæozoic rocks of America. I discovered and described the genera *Comarocystites*, *Amygdalocystites*, and *Malocystites*. In all that I have written on the subject I cannot find a single remark from which it could be supposed that I ever entertained such an idea.

which Mr. Billings considered as the enclosing sac, sometimes incrusts the Brachiopoda of the same formation.

"Mr. Niles referred to the interest these specimens afford to the naturalist, and gave a brief review of their scientific history and of the theories of prominent investigators. He then proceeded to show the cystidian affinities of the species by considering the complication of structure exhibited in the group as a type in geological history. He showed that all the features of the genus Cyclocrinites are, at the same time, embryonic and cystidian, and stated that so far as he knew, this is the only genus of the family yet discovered in America, although the family is well represented in the Palæozoic strata of Europe."

After seeing the above, I wrote to Prof. A. Agassiz, and he kindly sent me three of the specimens which possess the supposed orifices for examination. With all due deference, I do not feel at all convinced that the organs in question are anything more than accidental arrangements of the plates. In the true Cystideans there is usually a small aperture on the summit with a larger one below. This latter, in many species, is provided with a valvular apparatus of five or six angular plates. There is never more than one of those large lateral openings, (in the true Cystideans) but in one of the specimens from the museum at Cambridge there appear to be four; in another there are three. None of them have, at least to me, the aspect of the ovarian pyramid, as it is called, of the true Cystideans. We have (in the Provincial collection) two specimens of *P. Halli*, with the summits very well preserved, and they do not show any traces of an apical aperture; neither do they exhibit any signs of ambulacral grooves or arms.

Pasceolus Halli is covered with a thin integment, about one-third of a line in thickness, of a translucent horny colour, the surface minutely wrinkled but exhibiting no traces externally of a division into plates. It has not the peculiar crystalline fracture of crinoidal plates. When this integument is removed from the fossil, as it is in the Cambridge specimen, the whole of the surface of the coat of the interior is covered, with small polygonal spaces usually a little convex in the centre. Some individuals are incrusted with what appears to be a species of *Stenopora*. The Russian specimens are often over-grown in the same way, and Eichwald considers this incrustation to be a part of the integument itself. If he be correct in this view, then the structure of this genus is widely different from that of any known echinoderm. It may be that these bodies are akin to Salter's genus *Nidulites*, supposed to be collections of the eggs of some species of mollusca. In that case the coral-like tubes might have exercised the function of small capsules for holding the eggs.

Eichwald seems to describe *Cyclocrinus* as having an aperture in the summit, in which case it must be a distinct genus from *Pasceolus*. He does not figure any specimen showing the orifice, and it is evident that he

never saw it distinctly. And although the genus is classified by him among the Cystideans, he says, "La structure de ce corps énigmatique est en général trop peu connue, pour lui assigne la place qu'il doit occuper parmi les corps fossiles."*

I do not assert positively that *Pasceolus* is not a Cystidean, but think the evidence we possess is scarcely sufficient to authorize us to place it in that group. *Sphæronites tesselatus* (Phillips) appears to be closely allied, but is now considered by Mr. Pengelly (see Geologist), vol. iv,) to be a sponge.

The following are the species of *Pasceolus* collected in Anticosti.

P. Halli, B.—Gamache Bay ; Div. 1, A. G.

P. gregarius, n. sp. This species is smaller than *P. Halli*, and is always globular or nearly so. The individuals are from 6 to 12 lines in diameter, usually about 9 lines ; there are from three to four plates ? in the width of 2 lines. Reef Point ; Div. 1, A. G. J. Richardson. There arethe remains of about fifty in a small slab of limestone 5 inches in width and 7 inches in length.

P. intermedius, n. sp.—Globular ; about 12 lines in diameter ; four concave plates ? in the width of 3 lines. Three miles west of Jupiter River ; Div. 2, A. G. J. Richardson.

ADDITIONAL SPECIES FROM THE HUDSON RIVER GROUP.

Genus, Licrophycus, Billings.

L. formosus.—The specimen on which this species is founded has the main stem near the root (the latter not preserved) seven lines in thickness. In a length of three inches it is divided into eleven branches from three to four lines in thickness each. These are subdivided three or four times, the branches coming off at an acute angle. Several of the branches curve downwards. They appear to be, in some places, obscurely angular. English Head ; H. R. T. C. Weston.

L. vagans.—Branches long, slender, cylindrical and somewhat crooked. A specimen springing from a single root is spread out to the width of nine inches ; length six inches. The branches are from two to three lines in thickness. Near the West-end lighthouse, H. R. T. C. Weston.

L. robustus.—Branches about one inch in thickness and from six to

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* D'Eichwald,—Lethaea Rossica vol. i, p. 640.

ten inches in length. In one specimen there are five large branches with several smaller ones between them. They are all in contact and all curved in the same direction. English Head; H. R. J. Richardson.

Genus Særichnites, N. G.

The tracks, for which the above generic name is proposed, consist of two parallel rows of semi-circular or sub-quadrate pits, each pit about half an inch in diameter, usually a little more, and separated from the succeeding one about a quarter of an inch. They alternate with each other, uniformly, in such a manner that the centre of each pit is opposite the space between two pits in the other row. The pits are somewhat curved in outline on the outer margin, the anterior and posterior margins nearly straight; the bottom nearly flat, deeply impressed at the outer edge and becoming gradually more shallow to the inner edge where it runs out on the surface. There is a rounded ridge between the two rows of impressions which, however, is not elevated above the general surface. On one of these ridges an obscure median groove can be perceived. The foot? by which these impressions were made appears to have had a nearly flat bottom, or sole, with the outer margin somewhat sharp edged. The depth of the pits at the outer edge varies from one to six lines, usually about four lines. The width of the double rows of impressions varies from fifteen lines to twenty-four lines. The length of the tracks from ten to eighteen inches. In general they are more abruptly terminated and more deeply impressed at one extremity than at the other.

That these impressions are the tracks of an animal no one, accustomed to the aspect of fossil remains, who examines them carefully can doubt. To whatever class it may yet be referred it is evident that the creature had very short or rudimentary organs of locomotion. A molluscous animal with a foot flat on the bottom, with the median line quite soft and the lateral edges of a gristly consistence could by alternately moving each side make such tracks as these. I do not think they are the trails of trilobites. It is more probable that some of the species of Cephalopoda which swarmed in the Silurian seas could crawl along and make foot-prints in the soft ooze of the bottom of the ocean. There appears to be but one species for which the following name is proposed.

S. abruptus, n. sp.—The specific characters are contained in the above generic description. It occurs at Otter or Indian cove near English Head 229 feet above the lowest rocks observed on the Island. Also at Macastey Mountain and Observation Bay in the same horizon. H. R. J. Richardson.

These tracks are so numerous that in some places scarcely a square yard of the surface of the stratum in which they occur is without them.

LIST OF THE BRACHIOPODA FROM THE ISLAND OF ANTICOSTI NOTICED BY MR. N. S. SHALER.

(From Bulletin No. 4, M. C. Z.)

Column S. gives Mr. Shaler's nomenclature ; B. the names adopted in this work.

S.	B.
Lingula elegantula	Lingula quadrata.
" Forbesi	" Forbesi.
Strophomena semiovalis.	
" reticulata.	
" arcuata.	
" anticostiensis	Strophomena alternata.
" alterniradiata.	
Brachyprion leda	" Leda.
" ventricosum.	
" geniculatum.	
Leptæna Julia	" Julia.
" quadrilatera	" rhomboidalis.
Plectambonites glabra	Leptæna sericea.
" arca	" transversalis.
" tenera	" "
Orthis Laurentina	Orthis Laurentina.
" media	" media.
" anticostiensis	" porcata.
" æquivalva	" uberis.
" rhynchonelliformis	" rhynchonelliformis.
" alata	" Davidsoni.
Platystrophia regularis	" lynx.
Orthisina diversa	Orthisina Verneuili.
Atrypa impressa	Atrypa reticularis.
" flabella	Leptocœlia hemispherica.
Rhynconella fringilla	Rhynchonella fringilla.
" anticostiensis	" Anticostiensis.
" glacialis	" glacialis.
Brachymerus reversus	Camerella reversa.
Pentamerus Barrandii	Pentamerus Barrandi.
Athyris turgida.	
" umbonata	Athyris umbonata.
" prinstana	" Prinstana.
" Julia	" Julia.
Camerella Ops	Camerella Ops.
Spirifer tenuistriatus	Spirifera plicatella.

Of the fossils in the above list there are seven species which are not noticed in this work as I am unable to identify them. They are *Strophomena semiovalis*, *S. reticulata*, *S. arcuata*, *S. alterniradiata*, *Brachyprion ventricosum*, *B. geniculatum*, and *Athyris turgida*. Mr. Shaler was kind enough to send me specimens of most of the others and thus I am enabled to state that he has, in the bulletin, correctly identified such species

noticed therein as were previously described by me. The wide difference between us is due partly to the diversity of opinion as to the specific value of minute characters which must always exist among naturalists and partly to the unsettled state of the generic nomenclature of the Brachiopoda. Such points can only be adjusted by the mutual concurrence of the majority of palæontologists. I think that, at all events, some of the above specific names should be changed as they are pre-occupied by the following:

Leptagonia semiovalis McCoy, *Strophomena ventricosa*, Hall, *S. geniculata*, id., *S. arcuata*, id., *Orthis æquivalvis* Hall & Davidson, *O. alata*, Salter, *Atrypa impressa*, Hall, *Spirifer tenuistriatus*, Hall.

General Observations on the Palæozoic Fossils of Anticosti.

1. Lower Silurian.

In the Lower Silurian rocks of Anticosti there have been collected 121 species of fossils, of which the proportionally large number of 85 have been described in this and other publications of the survey as new forms. The remaining 36 are mostly of the common and widely distributed species of the Lower Silurian of Canada West, New York and other countries. They are the following:

Stenopora, fibrosa, S. mammulata, S. papillata, S. explanata, Halysites catenulatus, Lingula quadrata, Trematis Ottawaensis, Strophomena imbrex S. subtenta, S. planumbona, S. alternata, Leptæna sericea, Orthis testudinaria, O. subquadrata, O. lynx, Rhynchonella capax, R. recurvirostra, Ambonychia radiata, Subulites Richardsoni, Trochonema umbilcata, Pleurotomaria Americana, P. Helena, P. subconica, Murchisonia gracilis, M. ventricosa, Bellerophon acuta, B. bilobatus, Pterotheca transversa, Oncoceras constrictum, Asaphus platycephalus, A. megistos, Dalmanites callicephalus, Cheirurus pleurexanthemus, Harpes Ottawaensis, Calymene Blumenbachi, Leperditia Canadensis.

There are no species which are exclusively Upper Silurian; the aspect of the whole fauna is eminently Lower Silurian. The rocks are very fossiliferous throughout, but on approaching the dividing line between this group and Division 1 of the Anticosti group, which immediately succeeds, no less than 80 out of the 121 species suddenly disappear and are seen no more. It is evident, therefore, that there is here a break of considerable importance, probably, in some way connected with the great gap that occurs between the Hudson River and Clinton formations in Canada West and New York. Of the 41 species that pass this break, 30 appear to have become extinct during the period of the deposition of Division I, at least they have not yet been detected in Division 2. Of the remaining eleven species, seven pass upwards into Division 3, and six into Division 4.

The eleven species that survived the period of the deposition of Division 1, include *Stenopora fibrosa*, *Halysites catenulatus*, and *Calymene Blumenbachi* all three of which have a great geological range, and are, in most countries where they have been found, Lower, Middle and Upper Silurian. There are six new species,—*Heliolites affinis*, *Favosites prolificus*, *Zaphrentis bellistriati Beatricea nodulosa*, *Illœnus grandis* and *I. orbeaudatus*. The two remaining species are *Strophomena alternata* and *Murchisonia gracilis*, and these are the only ones out of the eleven that I consider to be eminently Lower Silurian forms. In view of these facts, it appears to be quite clear that during the period of the deposition of Division 1 the Lower Silurian fauna became extinct in the seas of the Anticosti region.

It is remarkable that out of the 85 new species, originally described from specimens collected in Anticosti, only three *Beatricea undulata*, *Orthoceras formosum* and *O. Xiphias* have since been detected elsewhere. The first of these occurs in the Hudson River formation at Lake St. John on the Saguenay, and also on some of the Islands in Lake Huron. The other two have been found in the Trenton limestone.

2. Middle Silurian—Anticosti Group.

Division 1.—The rocks of Division 1 rest directly and conformably upon those of the Lower Silurian, above noticed, with no apparent physical gap between them, although there is a palæontological break. It has been already stated that 41 of the species of the lower fauna pass this break. They are here joined by 45 additional species, making the whole fauna of this Division to consist of 86 species, so far as is yet known. Of these, 18 pass upwards into Division 2; 13 into Division 3, and 11 into Division 4.

Of the 41 species which are received from the Lower Silurian the following are known to occur in Canada West, and New York, and are variously distributed throughout all the formations from the base of the Quebec group to the top of the Hudson River formation.

Stenopora fibrosa, Halysites catenulatus, Beatricea undulata, Lingula quadrata, Strophomena alternata, S. planumbona, Leptæna sericea, Orthis porcata, O. Lynx, Orthisina Verneulli, Ambonychia radiata, Subulites elongata, Murchisonia gracilis, M. ventricosa, Bellerophon bilobatus, Pterotheca transversa, Orthoceras formosum, Ascoceras Newberryi, Asaphus megistos, Calymene Blumenbachi and Cheirurus pleurexanthemus;—21 species.

Among the 45 species which here made their first appearance in the rocks of Anticosti we find *Strophomena rhomboidalis*, *S. pecten* and *Atrypa marginalis*, all three very characteristic of the Middle and Upper Silurian. The new species include *Atrypa umbonata* and *A. Prinstana*, members of the group of which *A. tumida* may be regarded as the central

form, a type almost unknown in the Lower, but very prolific of species in the Middle and Upper Silurian. This group becomes extinct in the Devonian. The genera *Favosites*, *Heliolites* and *Helopora* which here first appear in force, are more characteristic of the upper than of the lower half of the Silurian series. Most of the other new species belong to the ordinary Silurian genera.

The fauna of this Division is partly Lower and partly Middle Silurian but is more strongly tinged with the former than the latter.

Division 2.—From this Division we have only 39 species of which 18 are received from Division 1, and 21 here first made their appearance. Out of the whole fauna 23, or more than one half pass into Division 3 and 16 into Division 4. As before stated, the only species very characteristic of the Lower Silurian are *Strophomena alternata* and *Murchisonia gracilis*. The most prominent fossil is *Pentamerus Barrandi* which occurs in vast numbers. Owing to the inaccessible character of the coast in bad weather, it was not practicable to make a thorough search for fossils in this Division.

Division 3.—In this Division there are 53 species, of which 23 are received from Divison 1, and 26 pass upwards. We here meet for the first time with *Pentamerus oblongus*, *Stricklandinia lens*, *S. lirata*, *S. brevis* and *Laptocœlia hemispherica*. These are all strongly characteristic of the Middle Silurian and occur in this Division and also in Division 4 in great abundance.

Division 4.—There are 70 species from this Division, of which 26 are received from below.

Conclusion.

The great abundance of such species as *Strophomena rhomboidalis*. *S. pecten*, *S. antiquata*, *Leptæna transversalis*, *Orthis Davidsoni*, *Pentamerus oblongus*, *Stricklandinia lens*, *S. lirata*, *S. brevis*, *Cyrtia Myrtea*, *Spirifera plicatella* and *Leptocœlia hemispherica*, together with the general aspect of the whole fauna of divisions 3 and 4, render it quite certain that this part of the series represents the Upper Llandovery rocks of England, and, perhaps, the Lower Llandovery also. They may not be exactly synchronous, for it seems to be now pretty conclusively demonstrated that a fauna may appear somewhat earlier in one region than in another. But, so far as we can at present decide the question by fossil evidence, these rocks are of the same age. I use the word fauna in a purely zoological sense, with no reference to geographical distribution. With regard to the Llandovery formation, Mr. Salter makes the following remarks :—" *The Lower Llandovery, or, as I prefer to call it, with Professor Phillips, the Llandovery rocks*," *are intimately united with the Caradoc, and pass up from them*

with a great admixture of Lower Silurian, not Upper Silurian, forms.

"The May Hill Sandstone, on the contrary, as Sedgwick showed in 1853, is unequivocally the base of the Upper Silurian, and contains scarcely any true Lower types." (SALTER. Geological Magazine, vol. iii., p. 240.) Now, the only deposit, as yet known in America, which exhibits such an admixture, is Division 1 of the Anticosti group. If, then, the extinction of the lower Silurian fauna occurred in the ancient British seas at the same time that it did in the American waters, it follows that Division 1 is Lower Llandovery; and that the Hudson River is Caradoc.

It is, however, very difficult to correlate all the divisions of the English Middle and Lower Silurian with those of America, and I shall take this occasion to make a few observations on the other members of the series not found in Anticosti. From what we know of the origin and mode of accumulation of sedimentary strata, it is highly improbable that each of the minor formations of one country should have its exact equivalent in another land several thousands of miles away, although the larger groups, of which these smaller ones are the component parts, may be well represented, and paralleled in a general way. Everywhere we find a number of breaks or gaps, and the probabilities are vastly against these breaks having been all occasioned at the same time in distant localities. It is more consistent with the nature of things that many of the breaks in America should stand opposite—so to speak—the formations in England and *vice versa*. Perfect parallelism of the minor groups may be looked for as the exception, not the rule.*

Comparing the Middle and Lower Silurian, I think we can identify, with certainty, only two horizons in England and America. The upper of

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* Professor A. C. Ramsay gives the following account of the breaks in the English series from the Lingula Flags up to the Wenlock Shale :—

"Lingula Flags:

Break very nearly complete both in genera and species, and probable unconformity.

Tremadoc Slate:

Break very nearly complete, both in genera and species, and probable unconformity.

Llandeilo and Caradoc beds:

Large break, especially in species, and probable unconformity.

Lower Landovery beds:

Break and decided unconformity,

Upper Landovery beds:

Break and strong unconformity.

Wenlock Shale," &c.

(RAMSAY. Anniversary Address to the Geological Society, 1863. Jour. Geo. Soc., vol. xix.)

these is that in which Divisions 3 and 4 of the Anticosti rocks are situated, which, as above stated, may be recognized in the Llandovery series, and is also, most certainly, the Clinton of Canada West and New York. The other is the Lower Lingula Flags, to be noticed further on.

In Canada West and New York there is an almost total palæontological break between the Clinton and Hudson River, partly filled by the nearly unfossiliferous Medina Sandstone. In Anticosti, Divisions 1, 2, and 3 seem to occupy the place of this break, and in England, apparently the Lower Llandovery, and, perhaps, some part of the Caradoc (including the breaks mentioned by Professor Ramsay.)

From the top of the Hudson River down to the base of the Black River limestone, there is no break, but all is occupied by a single, immense, highly characteristic, and compact fauna. The lower, middle, and upper portions of this series may be easily recognized by species peculiar to each, but the abundant and dominant forms, those that give a facies to the whole, are found throughout.

Between the Black River and Chazy there is another gap, but it is not of so decided a character. These two formations are connected by about twenty species. At the base of the Chazy in Canada West and New York, there occurs a great break, the importance of which has only become apparent during the last six years. The Lower Silurian of America can be divided into two principal groups—one above the break at the base of the Chazy, and the other below. The former includes the Chazy, Black River, Birdseye, Trenton, Utica, and Hudson River formations. The lower comprizes a series of formations, which are only now beginning to become known. These I shall more specially notice, commencing with the lowest.

The St. John's group, near the city of St. John, in New Brunswick, has lately been well characterized by Messrs. Matthew, Hartt, and Bailey. It consists of about 3000 feet of black slates and sandstones, and is underlaid conformably by a series of rocks very like those of the Cambrian. The fossils were determined by Mr. Hartt, several years ago, to be all primordial, and he correctly placed the formation in the horizon of Barande's "Etage C." We have lately, through the kindness of Mr. G. F. Matthew, received a collection for comparison. Among them I find the plates of a Cystidean, *Orthis!* 1 sps., another brachiopod, like a *Discina*, and species of the genera *Paradoxides*, *Conocephalitès*, *Arionellus*, *Microdiscus*, *and Agnostus*, with some others, all so closely allied to those, so excellently described and figured by Salter in his various papers, that I have no hesitation whatever in pronouncing these rocks to be the Lower Lingula Flags. I think this horizon is now as certainly determined in America by these fossils as is that of the Llandovery by the fossils of Divisions 3 and 4 of the Anticosti group. The St. John's slate (Jukes)

in Newfoundland and the Paradoxides beds rear Boston are, in all probability, of the same age. We have not yet discovered this fauna in Canada.

Judging from the aspect of the fossils I should say that what we call Potsdam group is more recent, but next in succession. It consists of two or three divisions. The lowest of these appears to be the sandstones and limestones on the north shore of the straits of Belleisle, and the rocks which, in the state of Vermont, are called the Georgia slates and the Red sand-rock. These are characterized by *Olenellus Vermontana*, *O. Thompsoni*, *Conocephalites Adamsi*, *C. Teucer*, *C. Vulcanus*, *C. arenosus*, *Bathyurus senectus*, *B. parvulus*, *Salterella rugosa*, *S. pulchella*, *S. obtusa*, *Obolus Labradoricus*, *Obolella chromatica*, *O. (Kutorgina) cingulata*, *Orthisina festinata*, *Camerella antiquata*. *Archeocyathus Atlanticus*, *A. profundus*, *Scolithus linearis*, *Palaeophycus incipiens*, and *P. congregatus*, with several other obscure forms of similar types. This fauna is totally distinct from that of the New Brunswick Lingula Flags, the St. John's group of Mr. Matthew. It might be called the Lower Potsdam.

We have next the Potsdam sandstone of Wisconsin and Minnesota holding so far as is yet known, about 50 species, mostly trilobites of a primordial type. There is some evidence to show that the upper part of the typical Potsdam of Canada and New York is of the same age. In these rocks Gasteropoda and Cephalopoda first make their appearance, although they are rare and the species small. The fauna is entirely distinct from those of the St. John's group and Lower Potsdam. It seems probable that the Lower and Upper Potsdam correspond to the Upper Lingula Flags, but this correlation cannot be clearly proved by the fossils as yet.

Next in succession comes the Lower Calciferous of Canada, New York, and Newfoundland. This is the original Calciferous sandrock of the New York survey. In this formation there are known to me nearly 150 species of fossils, about 100 of which are described. They are all with one exception (*Pleurotomaria Canadensis*) distinct from those of the Upper Potsdam. Gasteropoda and Cephalopoda become numerous, and *Lamellibranchiata* first appear rarely. This formation has been identified in Scotland by Sir R. I. Murchison and Mr. Salter, in the Durness limestone, but it has not yet been determined to what particular horizon in the English series the limestone in question belongs.

The Upper Calciferous has not yet been discovered in either Canada or New York. It has only been observed in Newfoundland where it is over 1000 feet in thickness, but has yielded as yet, only about 40 species of fossils. A few of these are found in the Lower Calciferous, and several pass upwards. This formation corresponds to divisions I. K. L. M., of the Newfoundland rocks described in the Geology of Canada, and also in my Palæozoic Fossils, Vol. 1.

Division N. of the Newfoundland rocks seems to be a distinct formation although intimately connected with the Upper Calciferous. We here first meet with the European genera *Acrotreta*, *Nileus*, *Holometopus*, and *Ampyx*. We have 48 species of fossils from this deposit of which 12 are found in the lower rocks and 3 pass upwards. I think it should be added to the Upper Calciferous.

Next comes the Lévis formation with about 220 species of fossils of which 51 are graptolites, many of them like those of the Skiddaw slates. A few, apparently 4 or 5 species, are Calciferous and about the same number Chazy. On the whole, this is a distinct fauna. There is a great break between it and the Calciferous below, and another between it and the Chazy above. Many of the trilobites are closely allied to the characteristic species of the upper Lingula Flags and Tremadoc slates.

Above the Lévis, we have the Sillery formation with only three species of fossils,— *Obolella pretiosa* and two small *Linguloe*, the latter undetermined.

Now in comparing all these formations with the lower part of the English Silurians, I believe, we have one horizon, the Lower Lingula Flags and St. John's Group, certainly identified, and another, the Lévis, and Skiddaw paralleled by some but not perfectly conclusive evidence. I do not see very clearly how to correlate the intermediate formations. We seem to have more than there is in the English series. Adding Div. N of the Newfoundland rocks to the Upper Calciferous the columns up to the Chazy would stand thus.

England.	America.
U. Llandeilo.	Chazy.
	Sillery.
L. Llandeilo. Identical ? with—	Lévis.
	U. Calciferous.
U. Tremadoc.	L. Calciferous.
L. Tremadoc.	U. Potsdam.
U. Lingula flags.	L. Potsdam.
L. Lingula flags. Identical with—	St. John's Group.

If the Lower Llandeilo and the Lévis formations be of the same age, then the Tremadoc and Upper Lingula Flags must have been deposited during the same interval of time with the four American formations between the Lévis and the St. John's Group. This appears to be all we can say about them at present. When we undertake to parallel them with each other we find there is a great difference in the grouping of the fossils. Thus in the Lévis we have quite a colony of trilobites belonging to the same group with those that Mr. Salter has placed in the genera *Conocoryphe* and *Dickelocephalus*, none of which in his recent lists (in Mem. Geo. Sur. G. B., vol. 3) are reported as occurring in the Lower Llandeilo, although they abound in the Tremadoc and Upper Lingula beds.

In America we have, below the Lévis, and therefore below the Lower Llandeilo, a large number of species of Gasteropoda and Cephalopoda. Many of these are undescribed, but taking all into account, I think there must be at least 40 Cephalopods and 80 Gasteropods in the Potsdam and Calciferous. Some of these are of large size, and in many localities the strata are crowded with the individuals. In England there are only 3 or 4 rare and small species known below the Lower Llandeilo. Among the other fossils there are no species common to England and America unless, indeed, some of the Graptolites. We have thus, as yet, scarcely any facts upon which we can safely proceed to parallel these ancient deposits with each other, although there can be little doubt but that, in a general way, the English series may be placed opposite that of America.

The same difficulties arise with regard to the Upper Llandeilo. This formation has been paralleled with the Trenton with which it possesses scarcely any palæontological character in common. According to the list published in 1859 by Sir R. I. Murchison (Siluria, p. 532-552), there are in the Llandeilo no Zoophyta of the group *Zoantharia rugosa*;—no Echinodermata of the orders *Crinoideæ*, *Cystideæ*, *Asteridæ* or *Edrioasteridæ*;—no species of *Rhynchonella*;—none of *Strophomena*;—only three small species of *Lamellibranchiata*; only 1 *Gasteropod*;—2 *Heteropods*, and 4 *Cephalopods*. The trilobites are all, with the exception of *Calymene Blumenbachi* and *Trinucleus concentricus?* specifically and to the extent of one-half generically distinct from those of the Trenton. The only other fossils common to the two formations are *Stenopora fibrosa*, *Halysites catenulatus*, *Leptæna sericea*, *Orthis striatula?* and *O. lynx*. These are all species of great geographical and geological range. With such great differences and so few resemblances it is scarcely possible to parallel the Llandeilo with the Trenton. It seems more probable that it should come in somewhere between the Chazy and Lévis formations. It has been often urged that such diversities as these may be due to differences in the character of the sediment. But I do not attach a great deal of importance to that suggestion. For example, the trilobites of the *Conocoryphe* and *Dikelocephalus* group above alluded to are found in vast numbers in Minnesota and Wisconsin in a formation of sandstone; at Point Lévis, in Canada, in a pure limestone, and in England in a formation of slate.

NEW SPECIES OF FOSSILS FROM THE CLINTON AND NIAGARA FORMATIONS.

CEPHALOPODA.

Genus Orthoceras, Breynius.

O. Oberon, n. sp.—Shell of the medium size, tapering at the rate of a little more than one line to the inch; section circular; Septa deeply

concave, about two to the inch where the diameter is thirty lines; siphuncle near the centre, small; surface with from eight to ten annulations in two inches.

Of this species only three specimens have been collected in Canada. The largest of these is 12 inches in length, 4 inches in diameter at the larger, and 3 inches at the smaller extremity. It does not show any of the septa. The second specimen tapers, from 42 lines to 34 lines in a length of 9 inches. Some of the septa next the chamber of habitation are obscurely visible. The third specimen, is a fragment showing seven septa in a length of 42 lines. The annulations are somewhat variable in form in the same specimen. Some are depressed convex or flat on the crest; others regularly convex, and still others have one edge abruptly elevated, giving a sub-imbricated aspect. Township of Grimsby; Niagara formation. J. Pettit. This species may be *O. imbricatum*, Hall, Pal. N. Y., vol. ii, not *O. imbricatum* Sowerby.

O. Cadmus, n. sp.—This species appears to attain a length of two or three feet with a diameter of three or four inches at the aperture. Section circular, or nearly so; septa from two to three in an inch; siphuncle nearly central, cylindrical, slightly constricted in the passage through the septa, from two to three lines in diameter. The rate of tapering appears to vary from about 1 line to 1½ lines to the inch. The chamber of habitation is 6 inches in depth, where the diameter of the aperture is 3 inches. In some specimens the aperture is slightly constricted. The shell varies in its characters. On the septate portion it is longitudinally fluted with concave furrows, separated by sharp-edged ridges; width of the furrows in a specimen 16 lines in diameter, 2 lines; where the diameter is 2 inches from 2½ to 3 lines. The furrows are often divided by a small elevated line along the middle. There are from 6 to 8 fine transverse engirdling striæ in the length of 2 lines. Longitudinal striæ are also visible, but they are not so distinct as the transverse. In specimens denuded of the shell there are only obscure indications of the longitudinal fluting. The chamber of habitation has numbers of wide shallow annulations with no indications of furrows on the cast, but these are seen on the shell in one specimen near the bottom of the chamber. It occurs in the township of Grimsby; Niagara formation. J. Pettit. This species appears to be *O. cancellatum*, Hall, not *O. cancellatum* Eichwald. *O. annulatum*, Sowerby.=(*O. undulatum*, Hall Pal. N. Y. vol. 2.) occurs along with it.

O. Brontes, n. sp.—Two or three feet in length; three or four inches in diameter at the aperture; section circular; tapering at the rate of about 1½ lines to the inch; septa from moderately to rather strongly concave, from five to eight in the length of two inches; siphuncle central or

nearly so, two or three lines in diameter. Surface unknown. The following are the dimensions of specimens :

1.—42 lines in length ; tapers from 22 lines to 18 ; 13 septa.

2.—5 inches in length ; tapers from 24 to 16 lines ; 18 septa.

3.—8½ inches in length ; tapers from 30 to 16 lines; 25 septa. At the larger end there are 11 septa in 4 inches ; at the smaller extremity 7 in 2 inches.

4.—Septate portion 8 inches in length ; tapers from 30 to 18 lines; 20 septa. The septa become deeply concave on approaching the chamber of habitation about two inches of which remain.

Grimsby ; Niagara formation. J. Pettit.

O. Pylades, n. sp.—Two or three feet in length ; largest specimen seen three inches in diameter near the aperture ; tapering about 1½ lines to the inch ; section circular ; septa about five in two inches ; siphuncle small and about half way between the centre and the margin ; chamber of habitation large. Surface unknown. The following are the dimensions of the two specimens examined :

1.—Length 12 inches, including chamber of habitation 6½ inches ; septate portion 5½ inches in length, with 14 septa ; tapers from 3¼ to 2 inches.

2.—4 inches in length ; 10 septa. The specimen is somewhat distorted, and the rate of tapering cannot be well determined.

This species occurs in Grimsby ; Niagara formation. J. Pettit.

O. Varro, n. sp.—This appears to be a small, slender, closely annulated and very gradually tapering species. The septa cannot be very clearly distinguished, but in two of the specimens there appear to be about twelve to the inch. The siphuncle is small and central, or nearly so. The annulations are well defined, uniformly concave in the bottom, and separated by somewhat acutely rounded ridges. Section circular.

A specimen 43 lines in length, tapers from 3½ to 1½ lines, and is ornamented with about 75 annulations. Most of these pass directly round at right angles, but others are oblique, and a few divide into two branches, and then unite again. There are eighteen in the first inch at the larger extremity, but towards the apex they become more numerous.

Another specimen 18 lines in length, tapers from 4 to 3 lines, and has 29 annulations, all of them at right angles.

To this species I refer, provisionally a specimen collected by Prof. R. Bell, at Rockwood. It is 42 lines in length, and tapers from 11 lines to 8 lines, and has 30 annulations.

Rockwood and Grimsby ; Niagara formation. Prof. R. Bell and J Pettit.

O. Remus, n. sp.—The following are the characters and dimensions of the only specimen of this species that has been collected: length 4 inches; tapering from 12 to 5 lines; section circular; siphuncle small not quite central; septa about 12 to the inch at the smaller extremity. Grimsby, Niagara formation. J. Pettit.

Genus Cyrtoceras. Goldfuss.

Fig. 23.

Fig. 24.

Fig. 23.—*Cyrtoceras Corydon.*

Fig. 24.— " *Clitus.*

C. Corydon, n. sp.—Shell rather strongly curved; slightly constricted at the aperture; gently inflated from the aperture for a little more than one-third the length; thence tapering and becoming gradually slender towards the apex. Section transversely ovate in the anterior half, and circular in the apical half. Siphuncle very small and close to the shell in the median line of the ventral aspect. Length following the curve on the ventral side about 35 lines; in a straight line from the dorsal side of the aperture to the apex 18 lines; dorso-ventral diameter of the aperture about 7 lines; lateral diameter about 8 lines; dorso-ventral diameter at the first septum 9 lines; lateral diameter 10 lines; depth of chamber of habitation 9 lines. Surface with obscure engirdling striæ, and small irregular constrictions of growth. Septa unknown. Grimsby; Niagara formation. J. Pettit.

C. Clitus.—Shell gently curved, slightly constricted towards the aperture; section nearly circular. The siphuncle appears to be small, and very near the shell in the median line of the ventral aspect. Septa unknown. Surface with obscure engirdling striæ and folds of growth. Length of the specimen following the outer curve 26 lines; dorso-ventral diameter at the aperture 7 lines. The transverse diameter is a little greater in the anterior

half of the shell, but towards the apex the section is circular. Township of Grimsby; Niagara formation. J. Pettit.

Genus Oncoceras. Hall.

This genus and *Cyrtoceras* pass gradually into each other, but may be retained with benefit to science for those species which are much inflated in the anterior half or two-thirds of the length. Of these there are many species which form a peculiar and interesting section.

Fig. 25.

Fig. 26.

Fig. 25.—*Oncoceras Teucer.*
Fig. 26.— " *Pettiti.* A small specimen.

O. Teucer, n. sp.—Shell much constricted near the aperture; strongly tumid on the ventral side; gently concave on the dorsal aspect; becoming more slender towards the apex. Section with the dorso-ventral diameter a little less than the lateral. Length of the specimen following the outer curve 23 lines; in a straight line 20 lines; transverse width in the constriction near the aperture 7 lines; at the most ventricose part, apparently at the third septum 8 lines; dorso-ventral diameter at the constriction 6½ lines; at the third septum 8 lines; depth of chamber of habitation about 4 lines. The three last septa appear to be about 1 line distant from each other in the middle of the ventral side, but as they are obscurely seen, further proof is required. Siphuncle unknown. Surface with obscure engirdling striæ or minute folds of growth. Township of Grimsby; Niagara formation. J. Pettit.

O. Pettiti, n. sp.—This species attains a length of four or five inches, and is somewhat variable in shape, the smaller individuals being more rounded in the section, and slightly more curved in the apical half. They all have the form peculiar to the genus,—constricted at the aperture, gradually enlarging for one-third or one-half the length, and then tapering

at first somewhat abruptly, and then gradually. In the smaller specimens the section is nearly circular, but in the larger it is more or less ovate, the dorsal, or side of the concave curve, being less convex than the ventral. The siphuncle is situated in the median line, near, but not in contact with the shell, about a line in diameter at the passage, but inflated to two or three lines between the septa. The chamber of habitation is large, apparently one-third the whole bulk of the shell. There are about four septa to the inch measured on the side of a specimen five inches in length. The surface is marked with obscure engirdling striæ which make a slight bend towards the apex along the median line of the ventral aspect. There are also faint indications of longitudinal sulci. The following are the dimensions of three specimens.

1.—Length following the curve along the middle of the ventral side 5 inches; dorso-ventral diameter of the aperture 18 lines; lateral diameter 22 lines; dorso-ventral diameter at the first septum 24 lines; lateral diameter 28 lines; diameter at the twelfth septum (at which point the section is circular) 10 lines; depth of chamber of habitation 22 lines. The ventral outline is curved to a radius of about 3½ inches. For about 9 lines from the aperture the shell enlarges very gradually, and then suddenly expands two or three lines.

2.—Length 4½ inches on the ventral curve; dorso-ventral diameter at the aperture 17 lines; lateral diameter 21 lines; dorso-ventral diameter at the last septum 22 lines; lateral diameter 27 lines; depth of chamber of habitation 24 lines; ventral aspect curved to a radius of 4 inches. The smaller extremity, where broken off, is about 9 lines in diameter.

3.—Length 3½ inches on the ventral curve; dorso ventral diameter at the aperture 14 lines; lateral diameter 16 lines; dorso-ventral diameter at the last septum 19 lines; lateral diameter 22 lines; curved to a radius of about 3 inches.

In all the specimens the dorsal aspect is less convex than the ventral but in some the difference is very slight. At first sight, taking extreme forms, it might well be thought that there are several species; but there is a transition, and I do not see how they can be separated. The individuals are numerous, but mostly in fragments. Grimsby; Niagara formation. This species is dedicated to the discoverer, Johnson Pettit, Esq., of Grimsby C. W., who has done good service to science in collecting many fossils from a formation difficult to work out.

O. Thales, n. sp.—Length five or six inches, proportionately not so ventricose as *O. Pettiti;* siphuncle not in the median line, but a little to the right thereof, moniliform, the segments two lines in diameter, nearly in contact with the shell; about four septa to the inch on the side. In a a specimen which, when perfect, must have been six inches in length, the

chamber of habitation is two inches in depth, and the greatest diameter two inches. The aperture is often very much constricted.

1.—Chamber of habitation only, length 2 inches; diameter of aperture, 16 lines; dorso ventral diameter at last septum, 22 lines; lateral diameter, 24 lines.

2.—Chamber of habitation and last two septa; dorso—ventral diameter of aperture, 17 lines; lateral, 18 lines; dorso ventral diameter at the last septum, 22 lines; lateral, 24 lines: depth of chamber of habitation, 26 lines.

3.—Length, 4 inches, but, when perfect, probably 6 inches; aperture visible on the dorsal side only; length of chamber of habitation, 30 lines; section at last septum nearly circular, and 25 lines across; there are 7 septa in 20 lines on the dorsal side. On the ventral side there are about 3 septa to the inch in large specimens.

This species differs from *O. Pettiti* in being more slender, and in having the ventricose position more extended in length in proportion to the whole length of the shell. The surface is covered with fine obscure transverse striæ, which make a sinus on the median line of the ventral aspect. Faint longitudinal sulci are visible on the cast.

Grimsby; Niagara formation. J. Pettit.

Genus, Streptoceras, N. G.

The above generic name is proposed for species having the form of *Oncoceras*, but with a tri-lobed aperture like *Phragmoceras*.

S. Janus, n. sp.—Large individuals are seven inches in length, and two and a half inches in greatest diameter; gradually enlarging from the aperture to about the mid-length; then more abruptly contracting; the apical fourth of the length more slowly diminishing. Section at the aperture sub-triangular; in the main body of the shell broad ovate or nearly circular and towards the apex circular, less convex on the dorsal than on the ventral aspect. Aperture, in contour, a triangle with the angles rounded, forming three lobes, one of which is ventral, and the other two lateral, but near the dorsal aspect. The ventral lobe is narrowly rounded, and forms a projection like the lip of a pitcher. The lateral edges (of the aperture) behind the ventral lobe are at first gently concave, and then gently convex, gradually rounding into the two lateral lobes; the dorsal edge between the two lateral lobes, is gently concave. The outline of the body of the shell on the dorsal aspect is nearly straight or slightly concave from the aperture for two-thirds the length, then curved. The ventral aspect almost uniformly arched to a radius of about four inches in a specimen seven inches in length. Siphuncle situated in the median line of the ventral aspect, moniliform, the segments nearly three lines in diameter. Septa about four to the inch on the side, becoming more numerous towards

the apex. Chamber of habitation more than one-third the whole length of the shell. Surface with obscure transverse striæ.

The following are the dimensions of the most perfect specimen:—

Length on the ventral curve 5½ inches; diameter of the aperture from the dorsal edge to the most projecting point of the ventral lobe, 21 lines; lateral diameter on a line drawn across at 5 lines from the dorsal edge and passing through the most projecting points of the lateral lobes, 21 lines; dorso-ventral diameter at the last septum, 25 lines; lateral diameter at the same, 29 lines; diameter at 27 lines (measured on the dorsal side) from the last septum 10 lines. The section is, here, circular. Depth of the chamber of habitation on the ventral aspect, 31 lines, and on the dorsal, 27 lines. This specimen is broken off at the thirteenth septum; when perfect it was probably about 7 inches in length.

Grimsby; Niagara formation. J. Pettit.

S. HEROS, n. sp.—Six or seven inches in length and nearly three inches in greatest diameter; gradually enlarging for about half the length and then tapering. Aperture with the lateral diameter much greater than the dorso-ventral; trilobed, all three lobes rounded In outline the ventral side is arched to a radius of about four inches, gently curved for the anterior half and more strongly from thence to the apex. The dorsal outline is very gently convex for more than half the length and then concave to the apex. Chamber of habitation more than one-third the whole length. Septa three to the inch on the side in the first two inches, more numerous towards the apex. Siphuncle in the median line of the ventral aspect, near the shell but not in contact therewith, two or three lines in diameter. Surface with obscure transverse striæ. The following are the dimensions of three specimens:—

1.—Length on the ventral curve, 7 inches; dorso-ventral diameter of the aperture from the middle of the dorsal edge to the most projecting point of the ventral lobe, 24 lines; lateral diameter on a line drawn across at 5½ lines from the dorsal edge, and passing through the most projecting points of the lateral lobes, 33 lines; dorso-ventral diameter at the mid-length, 30 lines; lateral, 34 lines; diameter, at 7 inches from the aperture, about 9 lines.

2.—Length, 5½ inches; dorso-ventral diameter of the aperture about 18 lines; lateral, 27 lines; dorso-ventral diameter at the mid-length, 28 lines; lateral, 31 lines; diameter at 5½ inches from the aperture, 11 lines; depth of chamber of habitation on the side, 30 lines.

3.—This specimen consists of the chamber of habitation (30 lines in depth on the side), and the four last septa. Dorso-ventral diameter of the aperture, 20 lines; lateral, 29 lines; dorso-ventral diameter at the last septum, 27 lines; lateral, 30 lines; dorso-ventral diameter at the

fourth septum, 20 lines: lateral, 21 lines. Grimsby; Niagara formation. J. Pettit.

This species is closely allied to *S. Janus*, but differs in having the aperture proportionally wider on the lateral diameter, and in the outline of the body of the shell on the dorsal aspect—straight or concave instead of convex. The two species are closely allied, and may yet be united by intermediate forms.

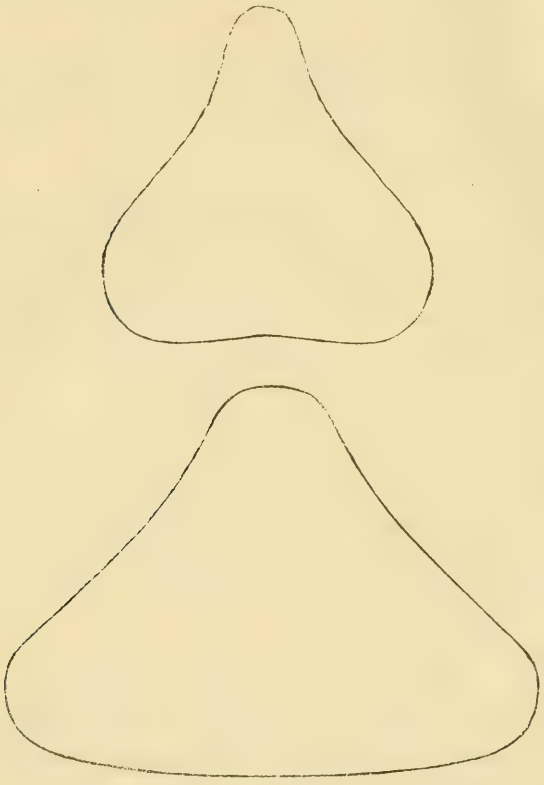

Fig. 28.

F. 28.—The upper figure represents the aperture of *S. Janus* in outline: the lower figure the aperture of *S. Heros*.

CYSTIDEÆ.

Genus, Apiocystites, Forbes.

A. Canadensis, n. sp.—Small, ovate, sub-pentagonal, rounded at the summit, truncated at the base. Arms five, four of them extending downwards to within one-fifth of the whole length from the base; the fifth a little shorter than the others. Mouth? a little above the mid-length, apparently closed by numerous small plates. The two upper

rhombs are on a line with the mouth, the lower close to the base. These rhombs are not double, (as they are in *A. elegans*, Hall), but single, i. e., the two triangles, of which each is composed, have their bases in contact, the elongated pores being continuous across the suture between the two plates on which each rhomb is situated. Regarding the side in which the mouth is placed as anterior, and the interbrachial spaces on each side of and next to it as the right and left sides, the rhombs are thus disposed :—the left hand rhomb has its longer diagonal extending obliquely downwards and backwards, at an angle of about 30° with the axis of the fossil :—the right rhomb has its longer diagonal very nearly at right angles to the axis :—the basal rhomb is mostly situated in the posterior interbrachial space on the left hand side and slopes downwards and backwards at an angle of about 45°, its lower angle passing under the third arm from the mouth. The arms are grooved along the middle, and have four or five pinnulæ on each side. The surface is covered with irregular elevated lines which in some places unite so as to inclose small polygonal spaces, giving to such parts a pitted aspect. Length, 7 lines; greatest diameter about 4½ lines. Only one specimen has been collected. *A. elegans*, Hall, has only four arms and the two halves of the rhombs separated. Grimsby; Niagara formation. J. Pettit.

Fig. 28.

Fig. 28.—*Apiocystites Huronensis.* A specimen partly buried in stone.

A. Huronensis, n. sp.—The specimen is partly buried in stone and its generic characters cannot be ascertained. The plates are moderately convex, depressed at the sutures. The rhomb at the base is one-half on a basal plate, and one-half on a plate of the second series. In the upper part is another rhomb, one-half of which is on a plate of the third series, and the other apparently on a plate of the fourth. The lower half, however, of the basal rhomb, and the upper half of the upper rhomb are not distinctly seen. As no arms are visible, it seems certain that this species is not a true *Apiocystites*. The position of the rhombs also favours this view. The specimen was found near Cabot's Head, on the shore of Lake Huron. Clinton; or Niagara formation. A. Murray, Esq.

A ? Tecumseth, n. sp.—This name is proposed for a Cystidean collected by Prof. R. Bell and H. G. Vennor, on Manitoulin Island in 1865. Only detached plates and fragments of the column were found. Most of the

plates have a large hemispherical protuberance which occupies all of the plate, except a narrow flat border all round. The rhombs consist of two separated triangular spaces, their bases separated as in *A. elegans*, Hall. The column has from three to four lines in length at the point of attachment, encased in an ovoid mass which is either a secretion of the column itself, or a parasitic Zoophyte, or, perhaps, a sponge. The surface of this part, as well as that of the tumid part of the plates, is covered with small polygonal pits. Near South Bay, Manitoulin Island; Prof. R. Bell, H. G. Vennor.

ZOOPHYTA.

Genus ZAPHRENTIS, Rafinesque.

Z. CINCTOSA, n. sp.—This species is three or four inches in length, and from nine to fifteen lines in diameter, engirdled with strong angular annulations, usually most abruptly elevated on the upper side, the spaces between concave. Tabulæ well developed; septa extending nearly or quite to the centre in the body of the coral, but in the bottom of the cup (as shown by one specimen) only about half way to the centre. Some of the individuals are more or less curved. Surface with very distinct rounded septal ridges, nearly three in one line, crossed by minute engirdling striæ. Huronia Point, and two miles north of McLeod's Harbour, on the east side of Cockburn Island, Lake Huron, also in the township of Derby, near Owen Sound, in the Clinton and Niagara formations. Prof. R. Bell.

Z. BIGSBYI, n. sp.—Turbinate, either straight or gently curved; from four to six inches in length, and from one inch to nearly three inches in diameter. Tabulæ well developed; three or four septa in the width of two lines. Cup moderately deep, with a rounded elevation in the bottom. Surface unknown. Differs from *Z. Stokesi* in its larger size, and more developed tabulæ. Huronia Point, and two miles north of McLeod's Harbour, on the east side of Cockburn Island, Lake Huron. Clinton and Niagara formations. Prof. R. Bell.

Genus CYSTIPHYLLUM, Lonsdale.

C. HURONENSE, n. sp.—From one to three inches in length, rather slender, straight or irregularly curved. Cup well developed, conical, inner surface with depressed convex vesicles, the largest of which rarely exceed the diameter of one line. Surface usually decorticated, but when perfect with from eight to ten septal striæ in the width of two lines. Huronia Point, and two miles north from McLeod's Harbour, on the east side of Cockburn Island. Clinton and Niagara formations. Prof. R. Bell.

Genus CYATHOPHYLLUM, Goldfuss.

C. SOLITARIUM, n. sp.—The specimen is four inches in length, and eighteen lines in diameter ; septa five or six in three lines. The edges of the lamellæ forming the vesicular cells, in the outer area, where, exposed by weathering, have an angular bend upwards, mid-way between the septa, giving the peculiar zig-zag appearance usually seen in silicified specimens of *Heliophyllum*. This species resembles *C. Anticostiense*, but appears to be more slender. Portage Bay, Manitoulin. Clinton and Niagara formations. Prof. R. Bell and H. G. Vennor.

Genus STROMBODES, Schweigger.

S. EXIMIUS, n. sp.—Corallum composite, apparently forming large depressed hemispherical colonies. Corallites from nine to fifteen lines across, the calice slightly concave in the outer half of the width, the central depression three or four lines wide. There are about fifty septo-costal radii in a corallite fourteen lines across.

This species differs from *S. pentagonus* and *S. striatus* (both of which occur in the same beds) in having much coarser radii. It very much resembles a *Phillipsastrea*. West point of Manitoulin Island, and two miles north of McLeod's Harbour, on Cockburn Island. Clinton and Niagara formations. Prof. R. Bell.

Genus OMPHYMA, Rafinesque.

O. CONGREGATA, n. sp.—Corallites cylindrical, from six to twelve lines in diameter, and three or four inches in length, growing together in large colonies, connected with each other by small radicles, but not in contact. Cup moderately deep ; a flat space in the centre, about one-third the whole width ; from sixty to eighty radii. Huronia Point, Cockburn Island, Lake Huron. Clinton and Niagara formations. Prof. R. Bell.

O. DRUMMONDI.—This is O. *verrucosa*, E. & H., not of Rafinesque. The corallites are turbinate, separate three or four inches in length, and sometimes eighteen lines in diameter. Cup deep, with about 100 radii. Huronia Point, Cockburn Island, Lake Huron. Clinton and Niagara formations. Prof. R. Bell.

Genus TREMATOPORA, Hall.

T. SUPERBA, n. sp.—The specimen is a hollow, cylindrical branched stem, five inches in length, and about six lines in thickness. The pores are about the tenth of a line in diameter, and from a little less to a little more than one line distant from each other. The thickness of the poriferous crust is about one line. Cabot's Head, Lake Huron. Clinton and Niagara formations. A. Murray.

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